SHORT COURSES IN AGRICULTURE

Short Courses in Agriculture, since they were established in the latter part of the 19th century, have made a large contribution to the agriculture of the country [U.S.]. Through them the colleges have been able to increase the earning power and satisfaction of thousands of people who for one reason or another could not take a four year course. In states where short courses have been made an important part of the work of the College of Agriculture short course graduates will be found holding important positions among important leaders. The short courses also have been of much direct help to the colleges in that they have aided in no small measure to establish in the minds of farmers a confidence in these institutions. Dr. Liberty Hyde Bailey, for years dean of the College of Agriculture at Cornell University, some sixteen years ago uttered these significant remarks in the presence of the writer, "Our Short Courses are just beginning. They are like a breath of fresh air in a close room. The short course students bring to Cornell the problems of rural New York in a more significant way than any other group of people. They are a challenge to the best that is in our staff.". . . .

Assuming that there is a field for it, [short course], it is an obvious fact that the fundamental factor in determining the ability of any work to succeed is its own character. From this point of view it is our opinion that the short course work must be organized and administered with the following policies in mind. First, that it is a phase of resident teaching, not extension, of sufficient duration and so organized that the student may learn certain methods and practices that may be of immediate value to him on the farm and from which he may also acquire certain fundamental principles that should enable him to analyze and solve for himself many of the problems that will arise in his farming. This work must also indicate to him where he may find help for himself and give him the inspiration and enthusiasm to continue, after leaving college, his study through careful reading. Secondly, the work must be an entity in itself so that when a person comes to the short courses he feels he is a part of the college or university life and his work is considered as important by the college authorities as he, himself, feels it to be. This means that he will come in contact with "Prexy" at least once and the dean several times; that his teachers will be the best instructors on the campus, not the poorest; that his program of study is not suspended or even interrupted because of the exigencies of other activities; and, that there are events, social and otherwise, planned and carried out that will make him feel at home and accord to the institution a loyalty that

will be sustained perhaps to as high a degree as though he had taken a four year course. Third, the course must be based on the needs of the agriculture of the state and the work of the student held to as high standards of attainment as is compatible with their preparation. It is through rather strict adherence to such policies that the short courses in New Jersey have had any degree of success with which they may be credited.

As to how far the Smith Hughes high schools have supplanted the short courses is a matter that involves the study of several questions. The theory behind this work, that is, of having the boy receive his training at home where he may have home influences, be at less expense, conduct a project on the home farm with the practical value that accrues not only to the boy but, perhaps, to the parents and neighbors as well, and be more likely to remain a permanent part of his home community, has a great deal to commend itself in its practical application, and these schools may be expected to render excellent service in the training of young people for the farm. At the same time there are certain factors that still allow splendid opportunity for the short courses. In the first place not all the boys, or even a majority of them, in any rural section enroll in the course in agriculture in the local high school. Some of them, on entering high school have not made up their minds as to what they really want to do and high school is over before they have made a decision. Still others, with farming as their future, feel that the usual high school subjects provide a better training for life and so do not take agriculture. Many of them, even in the agricultural departments, because of various reasons, drop out before their high school course is completed. Among all these groups is a considerable number of boys, who, in their late teens and early twenties, under normal economic conditions, finally decide to engage in farming. As a rule they do not care to return to high school with those younger than themselves and are not ready for college. The short courses at the college provide the opportunity for boys in these groups as well as for those in a great many sections which do not have, or are not near, Smith Hughes Schools.

A second factor, which can be discussed perhaps only with the risk of making what may seem to be comparisons disparaging to the high schools, and this surely is not intended, is the value of the Short Course work to young men. Twelve or sixteen weeks at the college, away from home, is an experience that in itself is worth a great deal to any young man. He learns how to stand on his feet, decide certain moral questions for himself, and, in rubbing elbows with boys from all parts of the state, learns not only more about his own commonwealth but also, consciously or unconsciously, measures himself against individuals and new situations. These experiences are not so likely to occur in the home environment. One of the greatest satisfactions that comes to those responsible for short course work is from the awakening and development of many a lad whose future had previously seemed uncertain because of his lethargy and provincial point of view.

Beyond these moral benefits of the short course work lies the value of a course of study in which the student comes in contact with a number of instructors, each of whom is a specialist in some phase of agriculture, and for which there is available the well equipped laboratories, libraries and other college facilities. Even the graduate of the agricultural course in the high school can benefit in these ways by using the short courses for "post graduate" work.

From these different angles we believe that even with the development of the large number of Smith Hughes schools they have not yet begun to occupy the field to the exclusion of short course work.—F. G. HELYAR, *Director of Short Course, Rutgers, New Jersey.*

—Reprinted from *Quarterly of Alpha Zeta, April, 1928.*

VIRGIL, THE FARMER

Virgil, the greatest of the Roman poets, was born on October 15, 70 B. C., and died on September 12, 19 B. C. He received a learned education at Milan, Naples, and Rome. His father was a small farmer near Martus, in Cisalpine, or Gaul. After completing his education, Virgil returned to his father's farm.

In 42 B. C., after the battle of Philippi, in which Antony defeated Brutus and Cassius, Virgil's farm was taken from him, for he had been on the side of the patriot, Brutus, "the noblest Roman of them all." Afterwards it was restored to him, and as an instance of his gratitude he composed the first of his eclogues, in dialogue form, which begins thus:

> Happy man! thy lands are yet thine own
> Lands broad enough for thee, although bare stones
> And marsh chop every field with reedy mud,
> Strange pastures shall not rear thy teeming ewes,
> Nor neighbors' flocks shed o'er them rank disease * * *

—*California Cultivator.*

GET IT DONE

It isn't the job we intended to do
Or the labor we've just begun,
That puts us right on the balance sheet,
It's the work we have really done.

Our credit is built upon things we do,
Our debit on things we shirk,
The man who totals the biggest plus
Is the man who completes his work.

Good intentions do not pay our bills,
It is easy enough to plan,
To wish is the play of an office boy,
To do is the work of a man.

SAVING LIFE

The difference between barbarism and civilization is the different valuation placed on human life. Back in the middle ages, when a few people were rich and the great multitude of "common people" were in poverty, human life was about the cheapest thing in the world. The great buildings of the past were built at the sacrifice of thousands of lives by people who carried burdens on their backs and worked under the lash of a taskmaster * * *

Electricity is just coming into its own on the farm. It will mean another big economy. Call it luxury to sit down and watch a power washing machine do the rubbing for you; I call it economy. It saves life. It creates more years of opportunity, leaves more strength for the things you want to do, gives the mind time to develop.

Take the milking machine as an example. Anybody who has milked cows seven days in the week will agree with me that it comes very near to slavery at times. The milking machine makes it possible to do the job just as well, at less cost, and leaves a man a lot more free to attend to other things and think about his farm management.

Think of these new things not as an expense, but as real hard-fisted economy. Why waste a man's time doing work that a machine will do for the ridiculous wage of two or three cents per hour? Why break your back, or wear out your wife's life carrying endless buckets of water when you can harness the pump with a quiet running system that delivers all the water you want? And, confidentially, why struggle around trying to get a bath in the washtub with a teakettle of water, when for comparatively little cost you can have the luxury of a big white tub brimming with crystal clear water, hot, warm, or cool, as you wish?

—*The Prairie Farmer* (Illinois).

THE JAPANESE IMPERIAL GOVERNMENT INSTITUTE FOR NUTRITION[1]

F. O. SANTOS
Of the Department of Agricultural Chemistry

Last April at the request of Dr. José Fabella, Public Welfare Commissioner for the Philippine Islands, and with the permission of the University of the Philippines, I went to Japan to study the nutrition work of the Japanese with special reference to the working of the Imperial Government Institute for Nutrition. At the Institute I was welcomed by the Director, Dr. Tadasu Saiki, who promised to give me all assistance in the work which I was planning to do and in the following words assured me of his earnest co-operation: "Our work is international and as such it is essential that we co-operate with each other." From the first meeting with the Director, I was impressed with his personality and with the enthusiasm which he showed in his work.

After an hour in the Institute, newspaper men arrived to interview me. The considerable attention the papers gave the purpose of my visit is a strong indication that the Japanese people as a whole are aware of the importance of the study of nutrition to the welfare of the people. A brief account of the work I was planning to do was published in several of the leading papers in Tokyo. The interest of the Japanese in my work was much greater than the interest of the Filipinos here at home. Within the first few days I was in Japan, many men came to me and said that they were glad to know that I had come to Japan for such a commendable purpose.

The longer I stayed in Tokyo the more I felt the strong personality of Doctor Saiki, the Director of the Institute. He has taken the study of nutrition as his life work and he is in it heart and soul. Besides performing the duties of Director of the Institute, he is also busy in other nutritional activities. The importance of the work Doctor Saiki is doing may be gauged by the fact that, financed by the League of Nations, he has just returned from a lecture trip in Europe and the two Americas. At present, he is maturing a plan for the holding of a Far Eastern Congress of Nutrition.

ORIGIN OF THE INSTITUTE

The Imperial Government Institute for Nutrition is an outgrowth of a private nutrition laboratory established by Dr. Tadasu Saiki in 1915. This laboratory investigated the nutritional problems of Japan "as an independ-

[1] Read at the meeting of the Los Baños Biological Club, July 26, 1928. Received for publication August 9, 1928. General cor tribution from College of Agriculture No. 209.

ent special branch of science which hitherto has been considered a mere insignificant branch of the medical or agricultural sciences." In this laboratory were studied the methods of improvement in the uses of main foods, the values of substitute food, the influence of unbalanced diet and also of the vitamins. It had a clinical division for diet therapy; and a bakery, where improvements in bread making were studied. Classes were held for physicians and school teachers. Popular lectures and demonstrations were given to the general public. The work of this private laboratory attracted the attention of the Department of Education which gave it certain sums of money for the encouragement of research. Then, the government realizing the importance of the work that was being done, in 1920 promulgated an ordinance establishing the Imperial Government Institute for Nutrition with Dr. Tadasu Saiki as director.

When the Institute was opened the senior scientist and the government authorities encouraged the members of the institute with the following words: "Research work requires time, do not hasten for achievement."

BUILDINGS

The corner stone of the principal building was laid in November, 1920, and it was completed by October, 1921. The whole plant cost about ₱350,-000. The following rooms and laboratories are provided for, each laboratory in a room by itself.

1. Room for guests.
2. Reading room.
3. The Library.
4. Toilet.
5. Vitamin Laboratory.
6. Laboratory for Economical Nutrition.
7. Animal Room.
8. Balance Room.
9. Incubator, Centrifugal and Shaking Machine Room.
10. Nitrogen Determination Room.
11. Digestion and Draft Room.
12. Hydrogen Sulphide Room.
13. Stock Room.
14. Ether Room.
15. Elemental Analysis and Ammonia Room.
16. Laboratory for Metabolic Experiments and Food Chemistry.
17. Machinery Room.
18. Polishing Room.
19. Stockroom.
20. Garage.
21. Toilet.
22. Room for Cookery.
23. Bathroom.
24. Employees Room for Women.
25. Kitchen.
26. Dining Room.

27. Employees Room.
28. Room for Night Watch Officer.
29. Room for Subjects under Observation.
30. Toilet Room for Subjects under Observation.
31. Attached Room for Physiological Laboratory.
32. Calorimetric Room.
33. Physiological Laboratory.
34. Director's Room.
35. Director's Laboratory.
36. Bacteriological Laboratory.
37. Microscopic Room.
38. Laboratory for Food Industry.
39. Boiler Room.
40. Laboratory for Food Industry.
41. Thermostat Room.
42. Koji Room (yeast cake).
43. Fermentation Room.
44. Stockroom.
45. Office.
46. Reception Room.
48. Optical Room.
49. Lecture Hall.
50. Garden for Famine Relief Food Materials.
51. Tank for Experimental Fish.
52. Poultry Yard.

PERSONNEL

The personnel of the Institute is as follows:

Director	1
Experts	7
Assistant experts	15
Secretaries	2
Volunteer investigators	

The experts may be classified as follows:

6 medical college graduates
5 pharmacological college graduates
6 agricultural college graduates
4 chemical engineers
1 scientific school graduate

Dr. Tadasu Saiki, the Director, is a very energetic man. He is a holder of the Ph.D. degree from Yale University, 1905, and the *Igakuhakushi*, one of the highest academic degree given by the Japanese Government.

Three of the experts have had foreign training in Europe and America.

The volunteer investigators are men who work for no pay but are given all facilities and are allowed to publish their work under their own names. These men are, therefore, able to use the results of their investigations for obtaining advanced degrees and are thus enabled to prepare for higher and better paid positions.

SALARIES

The investigators receive salaries which are relatively lower than those received by the professors in the College of Agriculture. In this connection it must be borne in mind that though the salaries of the Japanese are lower than ours, I am of the impression, although I have no figures on the subject, that living in Japan is a little cheaper than in the Philippines. It, also, is true, that the employees in the Institute are able to accept low salaries for, sooner or later, because of the training that they get there, they, later, secure much better paying jobs as the demand for well-trained scientists in Japan is very great. Japan has four imperial universities, several private universities and many technical schools and also scientific laboratories which are always in need of men well trained in scientific work. This state of affairs does not obtain in the Islands, hence the necessity for a man in our country demanding better pay as the chances for him to get work outside the university are practically nonexistent. The policy of the director of the institute in allowing the members of his staff to publish work under their own names encourages ambitious and energetic young men to accept lower pay. Because of their meritorious publications three members of the institute already have been honored by the government with the *Igakuhakushi* degree. With this degree, of course, went honors and increase in pay.

EQUIPMENT

The laboratories of the Institute are better equipped than ours of the University of the Philippines. In this connection, one can not help but notice the scarcity of foreign made apparatus in the Institute. Most of it is made in Japan—even the greater part of the chemicals used are manufactured in the country. However, when it comes to office equipment, even the poorly equipped College of Agriculture surpasses this famous Japanese Institute. Revolving chairs are unknown. The tables of the chiefs of the divisions are far inferior to the tables the College of Agriculture gives to the graduate assistants. *All is simplicity and money is not spent on things not essential to the real work of the Institute.*

The Institute has several clocks which attracted my attention for they were not keeping the right time; and I found that no effort was made to make them do so. On examination I discovered that the clocks are used only for experimental purposes and not for informing the workers when to stop and go home. It is not uncommon to see a man stay late in the evening for work that can not be stopped at the official closing time.

WORK OF THE INSTITUTE

The work of the Institute is divided into the following departments and divisions:

I. Department for Investigation of the Fundamental Science of Nutrition.
   1. Division of Food Chemistry.
   2. " " Metabolism.

3. Division of Physiology and Pathology.
4. " " Micrology.
5. " " Physics.

II. Department for Investigation of the Applied Science of Nutrition.
1. Division of Investigation of Food Materials.
a. Natural food products (including aquatic products and famine relief food materials).
b. Food Industry.
c. Investigation of Animal and Plant kingdoms for new foods.
2. Division of Economical Nutrition.
3. " " Preservation and Distribution.
4. " " Cookery and Tableware.
5. " " Infantile Nutrition.
6. " " Department of Waste Products.

III. Department of Inquiry.
1. Division of Inquiry, Statistics, Historical Materials.
2. Class in Nutrition, Exhibition, and Propaganda.

IV. Department of General Affairs.
1. Division of personal affairs, correspondence, etc.
2. Division of supplies and accounts.

Published work

The work of the Institute has been published in two volumes; unfortunately for us, it is written in Japanese. A third volume is under preparation. The titles of the most important publications are:

1. Studies on Japanese metabolism: I.
2. Studies on Japanese metabolism: II.
3. Determination of body area and its formula expressed.
4. Basal metabolism of free labor.
5. Excretion of urea-N and acidosis during fasting.
6. Mineral excretion during fasting.
7. General observation on fasting.
8. Fasting at Mount Narita.
9. Relationship between different grades of polishing and digestibility and utilization of rice.
10. Relationship between cookery and digestibility and utilization of rice.
11. Influence of bathing on metabolism.
12. Excretion of vitamin in urine—whether normal urine contains vitamin B or not.

Some of the publications are important enough to have attracted the attention of the League of Nations and the League has published the following in English:

1. The basal metabolism of normal Japanese men and women.
2. The basal metabolism of common laborers.
3. The measurement of the body surface area of man.
4. Metabolism during fasting and subsequent re-feeding.
5. Improvement of the physical condition of malnourished children.
6. Studies on the digestibility and utilization of rice of different grades of polishing.
7. The digestibility and utilization of rice cooked by different methods.
8. The biological value of the nitrogenous substances found in our main vegetable foods.

9. Biochemical studies on rice. Differences in the physico-chemical properties of the protein oryzenin as it occurs in glutinous and in common rice.
10. Biochemical studies of rice. Part I. Oxidase.
11. The relationship between the ehemical composition of rice and the different grades of polishing.
12. Chemical properties and nutritive value of the protein of Italian millet (*Setaria italica* Kth.).
13. Studies on the proteins of buckwheat (*Gagopyrum esculentum* Moench) and its nutritive value.
14. Vitamin content of Japanese food materials.
15. Relationship between the quantity of salts in a diet and the deficiency in vitamin A.
16. Formation of urinary and bile-duct calculi in animals fed on experiment rations.
17. Formation of gastric garcinoma in albino rats fed on deficient diets.

Besides these reports, the results obtained by the Institute are published in popular form in the daily papers. The radio which has invaded even the homes of the poor people in Japan is found to be a very good medium for the broadcasting of the work of the Institute. In Tokyo, every morning the radio broadcasts the names and the market prices of the foods obtainable.

Present investigations

At present, the following investigations are in progress:

1. On the curing of fructure by diets.
2. Formation and treatment of urinary gall-bladder and stones by means of diet.
3. Formation of cancer by diet.
4. Nutrition and wounds.
5. Investigation of vitamin content of Japanese food materials.
6. Nearsightedness and nutrition.
7. Quantitative analysis of bones.
8. Investigations on Japanese daily menu.
9. Relationship between life and nutrition.
10. Influence of mental work on digestibility and utilization of food.
11. On the sprouting of beans.
12. Studies on enzymes with reference to vegetable enzymes.
13. Studies on intestinal flora.
14. Reproduction and nutrition.
15. Mineral constituents of Japanese foods.
16. Nutritive value of famine relief foods.
17. Studies on vitamin D—anti-vitamin D or anti-calcifying vitamin in Japanese rice.
18. Pro-vitamin D—nature of in butter-fat.
19. Effect of sun-drying on vitamin D production in some Japanese dry food.
20. Utilization of rice-polishings (industrial) for fish (eels, carps, etc.).
21. Photosynthesis of food, especially carbohydrates and proteins.
22. Relations between nutrition and parasites, especially in fish.
23. Routine work on proximate analysis of Japanese foods.
24. Chemical methods of identification of old and new food materials—cereals, beans, etc.
25. Basal metabolism of Japanese school children (boys and girls).
26. Metabolism during muscular exercise and fatigue.

27. Relation of diet and fatigue, etc.
28. Metabolism during mental exercise.
29. On vegetarian diet.
30. Studies on hunger, fasting, and under-nourishment.
31. On the digestibility of foods, as rice, barley, wheat, buckwheat, etc.
32. On intestinal bacteria.
33. Effect of food on intestinal bacteria.

THE JAPAN NUTRITION ASSOCIATION

Working in co-operation with the Imperial Government Institute for Nutrition, but not a part of it, is the Japan Nutrition Association. This association was organized through the efforts of Doctor Saiki. At present, it is giving school lunches to more than 10,000 public school children. In Japanese elementary schools the classes continue from morning till afternoon and the pupils do not go home for lunch. The beneficial effect of these association lunches is so gratifying that the plan is being introduced in the private schools. The income of this association comes from government subsidy, from donations, and from contributions of members.

Progressive Japan finds it necessary to support an institute for nutrition. In the Philippines the need for studying the nutrition of the people is greater than in Japan. The welfare of the Filipino people demands that the Government pay attention to this important question.

GRAY SPOT, OR BLIGHT OF COCONUT[1]

FELIPE CORTEZ

WITH THREE PLATES

THE DISEASE

The gray spot, or blight of coconut (*Cocos nucifera* L.) is the most common leaf disease of this palm in the Philippine Islands. The malady seems to occur in all countries where coconut is grown.

According to Copeland (1921) *Pestalozzia palmarum* Cke. was first described from British Guiana. It has been reported that the disease has done a considerable damage in Mindanao, Malay States, New Hebrides, Saleier Islands, and Bismarck Archipelago. The disease became an epidemic at Kempit, Java, where the outbreak was studied and reported by Bernard.

Drieberg (1889) reported a parasitic fungus on the gray spot of coconut in Ceylon and Busck (1902) described the disease in Cuba. Stockdale (1906) reported the disease in Trinidad. The gray spot of coconut was first mentioned in Philippine literature by Barrett (1912) and subsequently by Baker (1914).

Munro and Brown (1920) reported an outbreak of the leaf disease in some of the young nurseries in Sumatra although there was but a little damage done.

The gray spot does not kill the coconut but, by killing portions of the pinnae, it undoubtedly reduces the capacity of the plant to synthesize its organic foods. Beyond the supposition that the disease affects the functional capacity of leaves of the coconut, nothing is known about the actual amount of injury that it produces. It is believed that gray spot does much injury because in severe cases all the leaves except the youngest ones appear gray owing to the abundance of the spots. But, it is not definitely known whether the *Pestalozzia* which is associated with the gray spot is the cause of the malady or a saprophyte on weakened tissues of the leaves and lesions that have been produced by other more aggressive parasites. With the exception of the work of Bertus (1927) in Ceylon, very little work has been done to establish the relation of *Pestalozzia palmarum* to the leaves of the coconut.

Symptoms and signs

In early stages of infection the disease is characterized by small, yellowish brown, circular to oblong, and more or less depressed spots which are

[1] Thesis presented for graduation, 1928, with the degree of Bachelor of Agriculture, from the College of Agriculture, University of the Philippines, No. 268; Experiment Station contribution No. 547. Prepared in the Department of Plant Pathology under the direction of Dr. G. O. Ocfemia.

about a millimeter in diameter (plate I, b.) The diseased areas gradually increase uniformly in length and width. The yellowish brown spots are seen surrounded by a grayish brown band which is about a millimeter in width. Sometimes this band does not extend completely around the spots. Within this brown band there is a cream-colored portion which appears much thinner than the healthy parts of the leaf. In some cases the thinner central portions of the spots appear dark brown. The lesions tend to grow in length parallel to the veins. On rainy days the spots appear grayish.

In advanced stages of the disease the spots may be as large as five centimeters long and one or more centimeters wide. The central portion of the spot becomes gray. The brown band at the border becomes dark brown. Two to five or more spots may coalesce forming larger, irregular, gray, dead areas. On the upper surface of the pinnae, black minute, dot-like bodies consisting of the fruiting structures of the fungus soon appear on the grayish center (plate I, d and plate II, fig. 1a and b and fig. 2c and d) The dead areas are then surrounded by dark brown bands. These bands are in turn surrounded by three zones. The first zone is yellowish green; the second, brown; and the third, or outermost, yellowish green. The third zone is of practically the same width as the first zone (plate I, d), which is about three millimeters. The middle zone is 1.5 millimeters wide. In some cases the pinna becomes yellow and then dies. Both young and old spots spread rapidly on rainy days. If the air is very dry, the lesions develop slowly, and the spots do not appear until the leaves are old. The lesions on the leaves which dry and fall off become gray, except the band at their borders which appears dark brown. The lesion becomes studded with the black minute fruiting bodies which generally appear on the gray central portion on the upper surface of the leaves, but sometimes on the lower surface. The lesions do not seem to increase in number but the mycelium spreads all over the upper surface of the leaves. During moist weather this mycelium becomes the source of the fruiting bodies which may spread all over the upper surface of the leaves (plate II, fig. 2a, b, c, d) and sometimes on the lower surface, too.

CAUSAL ORGANISM

Morphology

Pestalozzia is always associated with all gray spot lesions on coconut leaves. In advanced stages of infection the conidia of this fungus are present in the black specks of fruiting bodies. In early stages of the disease, the mycelium which is present on the lesions, when isolated, always proves to be that of a *Pestalozzia.*

Mycelium. In pure culture, both submerged and aërial hyphae are produced. When young, the submerged mycelium is densely granular, septate, hyaline, vacuolate and somewhat irregular in outline. The cross walls are somewhat hard to distinguish. When old, the granules of the

mycelium disappear. The aërial mycelium, when young, is very sparsely granular, and hyaline. When old, granules seem to be absent from the cells of the mycelium.

The hyphae are thin-walled and branched (plate III, fig. 2, 3, and 5). The branches arise either from the middle of the cell or near the cross walls. The branches are usually smaller than the main hyphae. Fusion of hyphae (plate III, fig. 3) similar to that of other higher fungi was noted on oatmeal agar culture.

The width of the hyphae varies from 1.8 to 6.48 μ on soybean agar and corn meal agar, and 1.8 to 6.84 μ on oatmeal agar. Bertus (1927) found that the diameter of the hyphae of *Pestalozzia palmarum* may be 3 μ on oatmeal agar and French bean agar, though usually between 2 to 3 μ in diameter on corn meal agar. As these figures show, the width of the mycelium of the Philippine *Pestalozzia* resembles that of *Pestalozzia palmarum* in Ceylon. Bertus (1927) states that the width of the swellings of some profusely branched and irregularly swollen hyphae reaches nearly 7 μ on oatmeal agar and about 5 μ on corn meal agar.

Fruiting bodies. In pure culture and on the leaves of coconut the fruiting bodies appear as black dots. On the leaves they are sub-epidermal (plate III, fig. 4), but at maturity they appear to be located on the epidermis because the epidermal layer is ruptured. In wet weather the mycelium spreads all over the upper and sometimes over the lower surface also and forms fruiting bodies outside of the lesions (plate II, fig. 2a, b, c, d). In pure culture they are formed on the surface of the media. The fungus produces acervuli though Bertus (1927) considers the fruiting bodies of *P. Palmarum* and *P. theae* Sawada as pycnidia. Cooke (1906) states that "*P. guepini* Desm. has no perithecia, the sporules (conidia) being produced in small cavities in the substance of the leaf the surrounding cells modified and discoloured so as to form a false receptacle." Duggar (1909) calls the fruiting bodies of *P. guepini* Desm. var. *vacinii* Shear acervuli.

Immature sporocarps are of various shapes (plate III, fig. 4). According to Bertus (1927) the fruiting bodies of *Pestalozzia palmarum* may be globose, spherical, rectangular or oval. The writer noted that the fruiting bodies from the leaves vary from 550.0 to 858.0 μ in diameter, but Bertus' (1927) measurements of the sporocarps of *Pestalozzia palmarum* from the leaves in Ceylon are much smaller, being only 130 to 420 μ in diameter. In pure culture, on soybean agar, the acervuli of the Philippine *Pestalozzia* may be up to 624.0 μ in diameter. Bertus (1927) reports that the greatest width of the fruiting bodies of *Pestalozzia palmarum* on oatmeal agar is 240 μ. The figures show that the fruiting bodies of the Philippine *Pestalozzia* are larger than those of Bertus' *P. palmarum.* The writer believes that the difference cannot be considered of taxonomic importance because it may be attributed to a possible difference of environmental and other conditions in the Philippines and in Ceylon.

Conidia. The conidia of the coconut *Pestalozzia* are borne on short hyaline pedicels (plate III, fig. 1 and 8). In pure culture they are 0.7 to 20.0 μ long, but on the leaves they are 0.7 to 3.3 μ. Bertus (1927) reports that the pedicels of the Ceylon *Pestalozzia palmarum* are 1 to 5 μ on oatmeal agar, 1 to 3 μ on French bean agar and corn meal agar, and 2 to 5 μ on the leaves.

In pure culture, the spores of the Philippine coconut *Pestalozzia* seem to arise from a pseudo-parenchymatous layer of the acervuli (plate III, fig. 4). They are yellowish to light green when young and turn brown with age. At maturity the conidia are free from the pedicels. They are spindle-shaped, somewhat curved, tapering at both ends with hyaline terminal cells, one of which, the distal end, bears appendages, and bulges in the region of the colored cells (plate III, fig. 1). The conidia are 11.7–28.3×3.3–6.7 μ in pure culture on oatmeal agar, soybean agar, and corn meal agar and 14.4–21.6×4.7–7.2 μ on the leaves. Bertus (1927) reports that the conidia are 15–25×5.0–7.0 μ in pure culture on oatmeal agar, French bean agar, and corn meal agar and 15–25×5–7 μ on the leaves.

On the leaves, the spores usually have from one to three hyaline appendages, though on the leaves and in pure culture on soybean agar they may have from one to four (plate III, fig. 1).

The conidia of the Philippine fungus and those of Ceylon average almost the same in size. The average size of the conidia of the Philippine fungus in pure culture is 19×4.7 μ, and on the leaves, 18.3×6.1 μ; those of the Ceylon fungus in pure culture are 18.7×5.5 μ and on the leaves, 20.2×5.7 μ.

The appendages of the spores from pure culture vary in length from 4 to 28.3 μ, and on the leaves from 7.2 to 25.2 μ. On the leaves the appendages are slightly bulging at the apical end. Bertus (1927) states that the appendages of the spores of *Pestalozzia palmarum* are generally about 5 μ in length, rarely 10 to 12 μ. He further states that on leaves the appendages are generally about 20 μ long, but a few spores have appendages as long as 40 μ.

The spores usually contain three brown cells, though some of them may have from one to five (plate III, fig. 1). In general, the appendages of the Philippine *Pestalozzia* in pure culture are 16.3 μ longer than the Ceylon species, but on the leaves those of the Ceylon *Pestalozzia* are 14.8 μ longer. The number of colored cells may vary on the leaves and on different culture media. On soybean agar, two to five colored cells may be present, and in rare cases a spore with six brown cells may be noted. On oatmeal agar the colored cells vary from one to four and on corn meal agar and on the leaves from two to three.

The conidia of the Philippine fungus in pure culture have from one to five colored cells and one to four appendages, while those of the Ceylon fungus have from three to five colored cells and two to three appendages.

On the leaves the conidia of the Philippine fungus have from one to three colored cells and one to four appendages, while those of the Ceylon fungus have from three to five colored cells and from three to four appendages. The conidia of both fungi have appendages with bulging apical ends. These slight differences seem to be due to environmental conditions.

Physiology

Germination of spores. Some of the spores from an acervulus of an 18-day-old culture on oatmeal agar were suspended in hanging drops of sterile rain water, and others in nutrient solution in Van Tieghem cells. The spores germinated in about four hours and twenty-three minutes in sterile rain water but they did not germinate in hanging drops of nutrient solution. The spores germinate by sending out a germ tube usually from the last brown cell toward the proximal hyaline end, though the germ tubes may appear from any of the colored cells also.

Behavior on artificial media and substrata. The fungus was grown in five culture tubes each of oatmeal agar, corn meal agar, soybean agar, potato-dextrose agar, water agar, corn meal, sterilized corn cylinder, camote stem, abacá corm, sugar cane stem, pepper stem, banana corm, eggplant fruit, and tomato stem. Twenty hours after the transfers were made, white, rather coarse, mycelial growth was observed on all media except on water agar on which the fungus did not produce growth. An abundance of growth was noted on oatmeal agar, soybean agar, and sterilized corn meal, and fairly abundant growth was made on corn meal agar and camote stem. On potato-dextrose agar, sugar cane stem, pepper stem, banana corm, and eggplant fruit the growth of the fungus was scanty. On tomato stem, abacá corm, and corn cylinders the growth was very poor. Yellow, glistening, butyrous, and spreading substance was noted on the seventh day at the center of the growth on potato-dextrose agar. As the cultures grew old this substance spread to the base and edge of the slants. Generally, the growth of the mycelium on all media was first slow and creeping, then it became faster, until the mycelium was thick. The growth of the hyphae was both aërial and submerged. On all substrata the growth of the fungus was generally aërial. Zonation was clear on all media, especially on oatmeal agar, soybean agar, corn meal agar, potato-dextrose agar, camote stem, and pepper stem. Two to three zones were noted on the growth of mycelium in four to six days. As the fungus grew old the growth in the first zone was usually covered with fruiting bodies. The mycelium then lost its fluffy appearance. Owing to the formation of numerous fruiting bodies the surface of the medium and substratum became covered with black, shiny, tar-like slimy masses of sporocarps. In some instances the growth on corn meal agar, soybean agar, and oatmeal agar extended farther than the base of the slants.

All the media were colored when they became old. The color[2] of the oatmeal agar was from cinnamon buff to light ochraceous salmon; corn meal agar, from sayal brown to ochraceous tawny; soybean agar, from isabella to buckthorn brown; and potato-dextrose agar, from hazel to cinnamon brown. All substrata became dark colored with age.

The fruiting bodies are at first silver gray, somewhat resinous specks, but later they turn tar black. The spores were produced five days after transfer on corn meal agar, potato-dextrose agar, sugar cane stem and corn meal. On oatmeal agar, soybean agar, abacá corm and eggplant fruit the spores began to form in four days. On camote stem, pepper stem, and banana corm the spores were produced three days after transfer. On corn cylinders the spores were formed in seven days and on tomato stem in fourteen. Spores were abundant on oatmeal agar, soybean agar, corn meal agar, camote stem, and pepper stem. They were fairly abundant on abacá corm, sugar cane stem, banana corm, and eggplant fruit. On potato-dextrose agar, corn meal, corn cylinder and tomato stem the spores were very few.

Growth in plate culture. Petri dishes containing corn meal agar, soybean agar, potato-dextrose agar and oatmeal agar were also used in the study of the growth of the Philippine *Pestalozzia* of the coconut. An opaque, white, rather coarse, mycelial growth was observed, as with the tube cultures on all media, 20 hours after the transfers were made. An abundant growth was produced on oatmeal agar and soybean agar plate cultures, and fairly abundant growth on corn meal agar plate cultures. The growth in four days was about three centimeters in diameter. Zonation was very distinct on corn meal agar and potato-dextrose agar. Two to three zones were observed at the end of six days. On potato-dextrose agar and corn meal agar plate cultures, the mycelium was somewhat scanty.

Growth in diffuse light and in darkness. Slant cultures on corn meal agar, soybean agar, oatmeal agar and potato-dextrose agar were placed in darkness inside a case and others were left in the laboratory close to the window to determine the effect of these upon the growth of the Philippine *Pestalozzia* of the coconut. Four days after the transfers were made the growth in the tubes on oatmeal agar in the laboratory was profuse, fluffy, white, cottony and rather confined above the surface of the agar. A few spores were noted in the tubes in the laboratory, but none in darkness. Five days after the transfer was made fruiting bodies were produced in the tubes of corn meal agar in the laboratory, while in darkness no fruiting bodies were produced. Seven days after transfer, fruiting bodies were present in the tubes of corn meal agar, oatmeal agar, and soybean agar in the laboratory, while in darkness only the tubes of soybean agar had fruiting bodies.

[2] The color nomenclature in this paper is after: Ridgway, R. 1912. Color standards and color nomenclature iii+43 p., 53 pl. Baltimore, Md.: A. Hoen & Company.

Observation seems to show that darkness hinders the growth of the fungus and its production of spores.

Pathogenicity

Field inoculation. In order to determine whether or not the *Pestalozzia* associated with the gray spot, or blight of Philippine coconuts, is capable of infecting healthy coconut leaves, inoculations were made using coconut seedlings about two years old on the experimental plot of the Department of Plant Pathology. Healthy seedlings were selected and the oldest leaves of these were removed. The pinnae of selected leaves were rubbed gently for five minutes with absorbent cotton immersed in 1:1000 mercuric chloride solution and then the disinfectant was washed off thoroughly with sterile rain water. Inoculations were made as follows:

(1) By spraying the leaves on the upper and lower surfaces with a suspension of spores from pure culture on potato-dextrose agar, oatmeal agar, soybean agar, and corn meal agar.

(2) By putting bits of agar containing the black fruiting bodies on the upper and lower surfaces using a sterile platinum needle.

(3) By placing bits of agar with the fungus on it on needle pricks made through the upper and lower surfaces of the leaves.

(4) By spraying with a suspension of spores on needle pricks made through the upper and lower surfaces of the leaves.

Each method of inoculation was checked with control pinnae which were treated in exactly the same manner except that no fungus was used. Some of the inoculated seedlings were bagged with paraffin paper and others were placed in large glass tubes which were plugged loosely with absorbent cotton at both ends.

On the third day, infection was observed on all pinnae inoculated through wounds, but no evidence of infection was noted on pinnae inoculated without wounds. Young infections were characterized by yellowish brown spots which were about a millimeter in diameter (plate I, b). The spots were circular to oblong and somewhat shrunken. The lesions gradually increased uniformly in length and width. The production of spots was accelerated by rain. The writer observed that in inoculations during dry weather the incubation period was not shorter than five days. In advanced stages of infection the patches became gray, as in natural infection (plate I, d). The spots turned dark brown. The lesions soon coalesced forming larger irregular dead areas (plate I, d). The black fruiting bodies appeared on the gray centers of the lesions on the upper surface of the pinnae in seven to eleven days. The control seedlings remained healthy throughout the experiments.

Inoculation of coconut pinnae by methods 3 and 4 was repeated 20 times, and inoculation by methods 1 and 2 was repeated 100 times, with the same results.

Damp chamber inoculation of coconut pinnae

Following Bertus' (1927) method of inoculation coconut pinnae were cut into pieces about fifteen centimeters long. They were sterilized for five minutes with 1:1000 mercuric chloride solution and then washed thoroughly in sterile rain water. Some of the pinnae were inoculated, following methods used in the field infection experiment on coconut seedlings. Other pinnae were inoculated by putting bits of agar containing fruiting bodies from pure culture on oatmeal agar on the upper and lower surfaces and by coating them with a thin layer of paraffin. Each method was checked with control pinnae which were treated in exactly the same manner except that no fungus was used. The inoculated and check pinnae were placed in separate glass damp chambers.

The pinnae inoculated without wounds and those coated with thin paraffin failed to take infection. All the pinnae inoculated through wounds gave 100 per cent of infection on the third day. One week after inoculation fruiting bodies appeared on the spots on the lower surface of the pinnae. The spots were identical with those obtained from field inoculation experiments. A slight difference in the formation of fruiting bodies, however, was noted. On the spots produced in the field the fruiting bodies appeared on the gray central portion of the spots on the upper surface of the pinnae. On lesions in damp chamber inoculations the fruiting bodies appeared on the lower surface of the pinnae. When field infected pinnae were placed in damp chambers the fruiting bodies developed either on the upper or lower surface. When the fruiting bodies were already developed on the upper surface of the pinnae in the field, when placed in the chamber some acervuli would also arise from the lower surface of the same pinnae. The control pinnae used in these experiments remained healthy throughout the work.

The abundance and uniform distribution of leaf spots in nature seem to be due to the fact that pinnae which dry and fall off because of numerous lesions become uniformly covered with the black fruiting bodies all over the upper surface and on part on the lower surface (plate II, fig. 2a, b, c, and d). It seems as if these fruiting bodies, if they are produced on the green areas of the pinnae, finally establish a food relation with the host. Although no work was done to check up on this point the writer believes that the spread of the fruiting bodies on the entire upper or lower surface of the leaves explains the distribution of the spots on the pinnae in nature.

Relation of moisture to infection. In all inoculations to determine the relation of the fungus to the coconut the writer noted that the lesions were produced earlier and they increased in size faster when it rained almost daily than during dry weather. When it did not rain for some time it took as long as five days for the spots to develop. Although no attempt was made to study the relative humidity of the surrounding atmosphere

which is most favorable for infection the writer believes that this observation shows that moisture favors the production of disease.

Re-isolations. In all inoculation experiments the fungus used was always obtained in re-isolation. From the incipient lesions re-isolations of the causal fungus were made and in all cases a *Pestalozzia* identical with the organism used was recovered.

Relation to other plants. The writer found that the *Pestalozzia* of the coconut leaves is able to infect, through wounds, cabo-negro (*Arenga saccharifera* Wurmb), pugahan (*Caryota cumingii* Blume), buñga (*Areca catechu* L.), royal palm (*Oreodoxa regia* HBK.), and *Phychosperma macarthurii*.

Taxonomy

The spores of the Philippine coconut *Pestalozzia* have one to five brown cells. Bertus (1927) mentions three as the typical number in the Ceylon fungus although he found two abnormal spores on leaves, and one abnormal spore on French bean agar containing five brown cells. The writer noted that spores containing four colored cells were common on oatmeal agar culture and five on soybean agar culture. The appendages of the Philippine coconut *Pestalozzia* are bulging at the apical end in nature as in the Ceylon fungus (Bertus, 1927). Measurements of the Philippine coconut *Pestalozzia* are nearly the same as those of the Ceylon organism. The average size of the spores of the Philippine and Ceylon coconut *Pestalozzia* are shown in table 1.

TABLE 1

Average size of the spores of the Philippine coconut Pestalozzia as compared with those of the Ceylon Pestalozzia palmarum

OBSERVER	SOURCE OF SPORES	LENGTH, INCLUDING TERMINAL HYALINE CELLS	LENGTH OF COLORED CELLS	WIDTH
		microns	*microns*	*microns*
The writer	Coconut Pestalozzia in nature	18.3	11.2	6.1
Bertus	Coconut Pestalozzia in nature	20.2	13.8	5.7
The writer	Coconut Pestalozzia in culture	19.0	12.0	4.7
Bertus	Coconut Pestolozzia in culture	18.5	12.0	5.5

Bertus (1927) states that the appendages of the spores of the Ceylon coconut *Pestalozzia* are comparatively short, being on the average about 12 μ long. The writer found that the appendages of the Philippine coconut *Pestalozzia* are comparatively long.

There is a close agreement in the average size of the spores of the Philippine and Ceylon coconut *Pestalozzia*. The average size of the spores in pure culture is nearly the same as that of the Ceylon species of Bertus (1927), except in the length including the terminal hyaline cells, those in the Philippine fungus are 0.4 μ shorter. The average width of the spores

of the Ceylon fungus in nature is only 0.3 μ narrower than that of the Philippine organism. In nature the average length of the spores of the Philippine *Pestalozzia* including the terminal hyaline cells is 1.9 μ shorter than the Ceylon. The average length of the colored cells of the Philippine fungus in nature is 2.6 μ shorter than the Ceylon fungus.

In pure culture the Philippine and Ceylon fungi do not produce appendages which bulge at the apical end. They both produce appendages of this kind in nature. They can not infect leaves of coconut unless these are wounded.

The discrepancies in size of *Pestalozzia palmarum* Cke. and the writer's coconut *Pestalozzia* are very small and they cannot be considered of taxonomic importance. In morphological and host relationships the writer's coconut *Pestalozzia* cannot very well be separated from the widespread *P. palmarun* Cke. The writer concludes that the Philippine species is identical with *Pestalozzia palmarum* Cke. of Bertus (1927) of Ceylon.

LIFE HISTORY OF PESTALOZZIA PALMARUM CKE. IN RELATION TO PATHOGENESIS

Source of inoculum for natural infection

Pestalozzia palmarum Cke. is normally a facultative parasite. The mycelium thrives on old and dead coconut leaves in the field. When conditions are favorable for its development the mycelium produces fruiting bodies the spores of which are inocula for primary infection in the field.

Method of dissemination and transmission

Pestalozzia palmarum is abundant in every coconut plantation near the College of Agriculture and in Laguna and Tayabas provinces and probably elsewhere in the Philippines. The fungus may be carried unintentionally by men from one place to another with green or dead leaves. No work was done to determine the exact method of transmission. On account of the fact that at maturity the fruiting bodies are open and the conidia are readily detached the writer believes that rain and wind are the most important agencies of dissemination.

Method of penetration

The fungus penetrates the host tissue only through wounds. Stockdale (1906) states that "infection experiments leave no doubt that this leaf fungus (*P. palmarum* Cke.) may be weakly parasitic, and show that infection can take place by the germination of the spores, the germinal tubes of which can pass through the stomata of the leaf and through wounds of any kind on the leaf surfaces. No result, however, was obtained when the spores were placed on the upper surface of an uninjured leaf, which may indicate that these germinal tubes are incapable of penetrating through the epidermis of the leaf." In the writer's work the fungus infected the leaves only through wounds. The uniform distribution of leaf spots in nature seems

to be occasioned by the mycelium which radiate in all directions outside the original lesion. This mycelium on invading the healthy green areas produces other lesions.

Relation of the mycelium to the host cells

Examination of free hand cross sections of the lesions showed that the hyphae are intercellular. After the hyphae gain entrance into the tissues of the leaf, they branch out in all directions. A lesion when examined under the microscope shows the mycelium forming web-like structures. The tissues of the lesion die in about 70 days. At this time the fruiting bodies are conspicuous.

Method of aestivation

The fungus lives, from one season to another, as mycelium within the tissues of the coconut leaves. The leaves which dry and fall off owing to the disease serve as the resting place of the fungus.

CONTROL MEASURES

Under field conditions the Philippine *Pestalozzia palmarum* may cause serious injury to coconut leaves especially if environmental conditions are favorable, or in places not wholly suitable for coconut culture. The writer did not study special control measures. The following measures which may be of value in seed beds and in young groves in the Philippine Islands are recommended by various authors.

According to Copeland (1921), Bernard working in Java recommended that all infected leaves be cut off and burned *in situ;* that there be constant watch for the reappearance of the disease; that planting a great number of trees of the same age at the same time be avoided so that a large number will not reach the susceptible age at the same time; and that trees be sprayed with 2–2–50 Bordeaux mixture at intervals of fifteen days, taking care to reach the youngest leaves.

Munro and Brown (1920) recommend the cutting off of slightly and seriously affected leaves. Diseased leaves as well as dead palms should be burned right on the spot.

Sampson (1923) recommends that Bordeaux-resin-soda mixture instead of ordinary Bordeaux mixture should be used for spraying at fortnightly intervals.

Reinking (1918) states that in severe cases of infection of young trees, spraying with Bordeaux mixture is effective. He also advises burning dead and diseased leaves to reduce sources of inoculum.

Stockdale (1906) recommends the destruction and weakening of the fungus, probably by the use of fungicides and by inducing vigorous growth of the trees through manuring, proper cultivation, and irrigation or drainage. Inducing vigorous growth of trees seems to be of great importance. It

appears that in places best suited for coconuts and where trees are vigorous that the disease is not common. On account of the great number of spores produced by the fungus, Stockdale suggests that all dead trees should be cut down and all of their parts collected and burned.

SUMMARY

1. The gray spot, or blight of coconut is the most common leaf disease of this palm in the Philippine Islands.

2. The damage caused by the disease in the Philippines and elsewhere is very difficult to determine.

3. The outward manifestation of the disease when young is the presence of small yellowish brown, circular to oblong and more or less depressed spots which are about a millimeter in diameter. When old, the spots may be up to five centimeters long and one centimeter wide. The central portion of the spot becomes gray and soon contains black minute dot-like bodies consisting of the fruiting structures of the fungus.

4. The gray spot, or blight of coconut in the Philippines is caused by a species of *Pestalozzia* which is considered identical with *P. palmarum* Cke.

5. The mycelium is densely granular, septate and somewhat irregular in outline when young, but when old the granules disappear. The hyphae are thin-walled, branched and some of the adjacent cells have a tendency to fuse.

6. The acervuli are sub-epidermal on the host and erumpent but are formed on the surface of the media in culture.

7. The spores are spindle-shaped, somewhat curved, tapering at both ends, with hyaline terminal cells, one of which, the distal end, bears appendages and bulges in the region of the colored cells. The spores usually have from one to three hyaline appendages, though on the leaves and in pure culture on soybean agar they may have from one to four. They usually contain three brown cells, though some contain from one to five and one hyaline pedicel. The spores are 11.7–28.3×3–3–6.7 μ in pure culture on oatmeal agar, soybean agar, and corn meal agar and 14.4–21.6× 4.7–7.2 μ on the leaves. Generally, they germinate by the production of germ tubes from the last brown cell towards the proximal hyaline end.

8. The spores germinate in about four hours and twenty-three minutes in sterile rain water. Field inoculations show that the Philippine *Pestalozzia palmarum* is capable of infecting, besides coconut, cabo-negro (*Arenga saccharifera* Wurmb.), pugahan (*Caryota cumingii* Blume), buñga (*Areca catechu* L.), royal palm (*Oreodoxa regia* HBK.), and *Phycosperma macarthurii*. The fungus penetrates the host tissue only through wounds and the hyphae in the leaves are intercellular.

9. The fungus may be carried from one place to another with green or dead leaves by man. The spores may be spread chiefly by wind and

rain. The fungus lives from one season to another as mycelium within the tissues of the leaves.

10. Spraying young trees with standard Bordeaux mixture using resin-salsoda sticker, cutting and burning infected leaves *in situ* seem to be appropriate measures for controlling gray blight of coconut in young plantations and in nurseries. Inducing production of vigorous plants is said to enable coconuts to resist infection.

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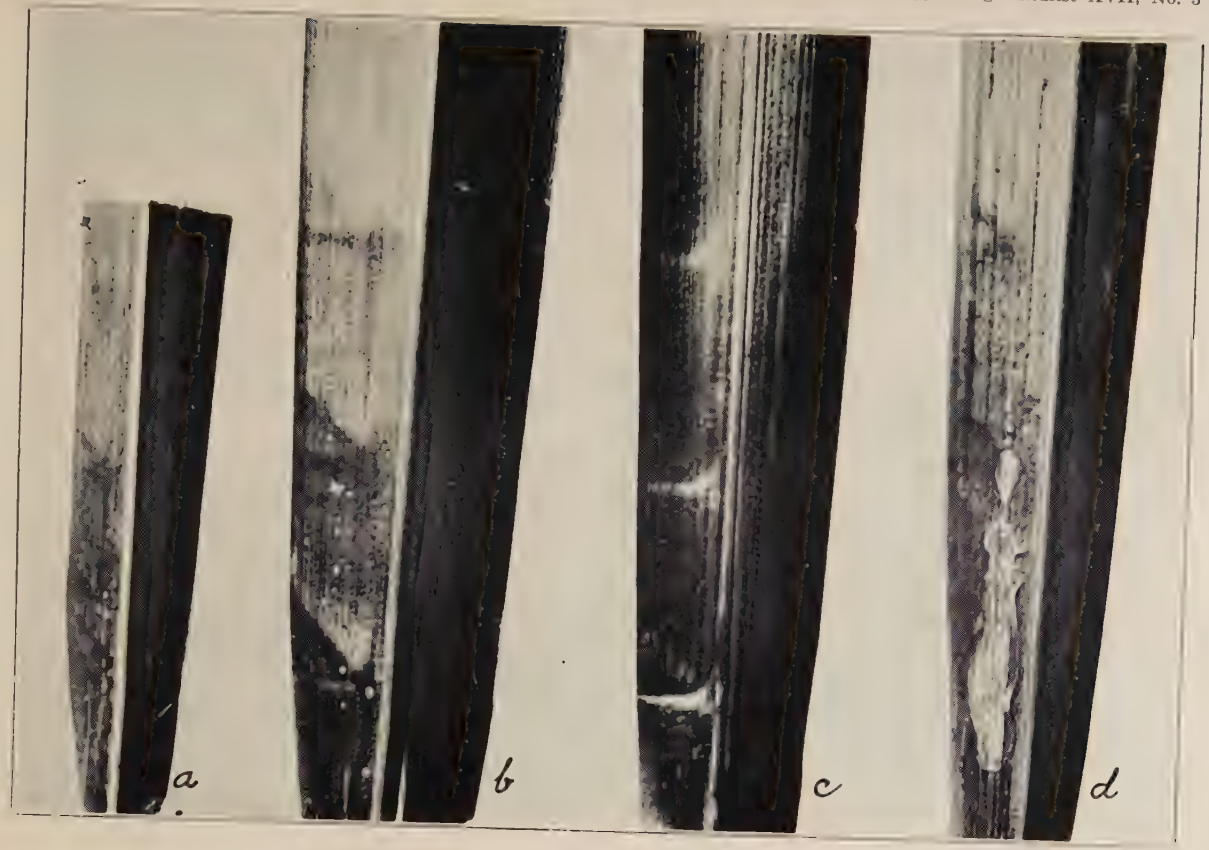

PLATE I

a. Portion of a pinna of coconut wounded with sterile needle pricks and used as check in the inoculation experiments. Nearly natural size. *b*. Portion of a pinna inoculated through wounds showing 15-day old infection. Nearly natural size. *c*. Portion of a pinna inoculated through wounds showing 31-day old infection. Nearly natural size. *d*. Portion of a pinna inoculated through wounds showing lesions of 78-day old infection. Note that the spots have coalesced and fruiting bodies are present on the dead gray patches. Nearly natural size.

PLATE II

Fig. 1*a*. Portion of a pinna showing the spots produced by artificial inoculation through wounds. Slightly reduced. *b*. Portion of a pinna showing the spots produced in natural infection. Compare lesions with those on figure 1*a*. Slightly reduced. *c*. A control pinna showing absence of lesions. Slightly reduced.

Fig. 2*a*, *b*, *c*, *d*. Portions of old pinnae showing the distribution of the minute fruiting bodies on the upper surface and on the midrib as indicated by the arrow heads. This is very common on old infected leaves in field infection. These minute bodies appear black but in the picture some of them appear white because of the light. Natural size.

(All photographs by the Photographic Division, Department of Agronomy, College of Agriculture, Los Baños, Laguna, P. I.)

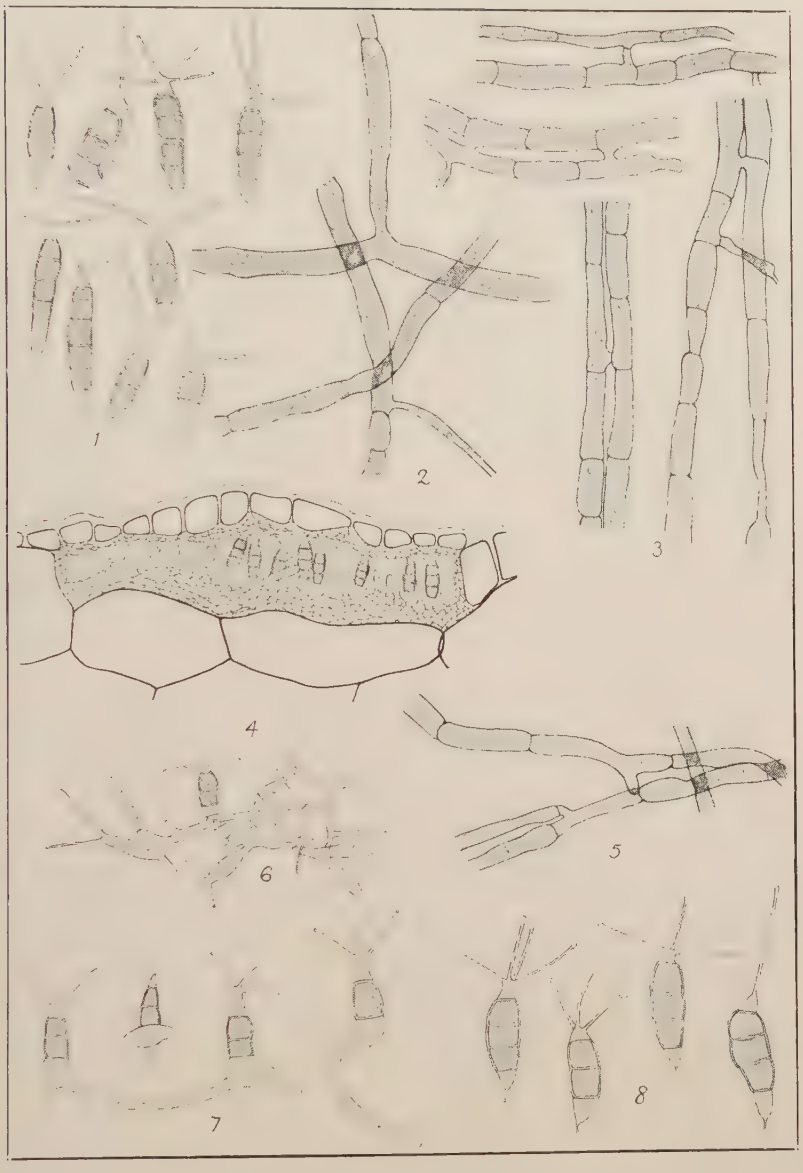

PLATE III

1. Conidia from pure culture showing from one to four appendages and one to five colored cells. About 627×.
2. Young submerged hyphae from pure culture. About 665×.
3. Old submerged hyphae from pure culture showing the fusion of hypha. (a) About 616×, (b) about 626×.
4. Free hand section through a young acervulus on a leaf from natural infection showing position of the conidia in the subepidermal fruiting body. About 393×.
5. A young aërial mycelium from pure culture. About 665×.
6. Germ tubes with the young secondary conidia arising from the mother spore. About 453×.
7. Germinating conidia showing the different ways of issuing germ tubes. About 560×.
8. Conidia from the leaves with from one to four appendages and blunt apical ends and two to three colored cells). About 733×. Spores containing only one colored cell are also produced in the field.

(All drawings were made under the oil immersion objective of a DDS Bausch and Lomb microscope using a camera lucida.)

A STUDY OF THE FEEDING, CARE, AND MANAGEMENT OF NATIVE CALESA HORSES AT LOS BAÑOS, LAGUNA[1]

ANTERO P. INCIONG

The objects of this investigation were: (*a*) To find out the kinds of feeds given calesa horses in Los Baños and the amounts consumed; (*b*) to investigate the care and management of these horses; and (*c*) to find out the amount of work performed by them.

The work was carried out in Los Baños, Laguna, from July, 1925, to December, 1926, covering a period of one year and five months.

MATERIALS

Animals

Twenty-five calesa horses ranging in age from three to fourteen years were used in this work. Of these horses, eighteen were stallions, five were mares, and two were geldings. These animals averaged in age, 6.8 years, in height, 123.76 centimeters, and in weight, 206.06 kilograms. (See table 1.)

Scales

The horses were weighed on a pit stock scale.

A spring balance was used in determining the weight of the feeds consumed and left over by the horses.

PROCEDURE

In selecting the twenty-five animals for this investigation, thirty-one were examined as to health and condition and the sickly animals were eliminated. The habits of feeding and thriftiness of the thirty-one were observed for a few days so that those with owners that were unusually careless, ignorant, or brutal could be eliminated.

In determining the consumption of feeds, the weight of the feed given as well as that left in the manger was taken, the difference representing the amount consumed. This was done at each of the three daily feedings. The animals were weighed for three consecutive days at the beginning and end of observation. The work performed in kilometers daily was determined and recorded. Other observations on the management of each animal, such as shoeing, grooming, bathing, clipping, and trimming of mane and tail and the condition of the stables were also made and recorded.

These observations were made for forty days with each horse.

[1] Thesis presented for graduation, 1927, with the degree of Bachelor of Agriculture from the College of Agriculture No. 269; Experiment Station contribution No. 548. Prepared in the Department of Animal Husbandry under the direction of Dr. Valente Villegas.

DISCUSSION OF RESULTS

Feeding

Method. Horses that were fed only in the stable were given feed at least three times a day —morning, noon, and afternoon. Horses that were pastured part of the time were given feed in the stable irregularly. As a general rule, feed was given to horses at any time they were returned from work.

Concentrates. The concentrates given to the horses included rice bran, corn, and rough rice. The rough rice was used with only three animals. As may be seen in table 3, the amount of concentrates fed to the horses ranged from zero to an average of 3.3 kilograms a day or 1.6 kilograms for every 100 kilograms live weight. Only two animals observed received an average of more than three kilograms of grain a day, and six horses did not receive any concentrate throughout the whole period of investigation. The majority of the animals received from one to one and five-tenths kilograms of grain a head, daily. Only six horses received a regular supply of concentrates; they were given 2.3 kilograms a day; the remaining nineteen horses were given grain only when work was done by them and corresponding earnings obtained by owners.

During the investigation, corn was given shelled except to one horse which received corn on the cob a part of the time. This grain was given alone and dry. Generally, it was given before the feeding of roughage.

Rice bran was mixed in the water given for drink. This practice is claimed to be advantageous in that a horse will drink more water and consume more rice bran than if each is given alone.

Only three horses (the same animals that were fed rough rice) received molasses. This feed was given in water. It was observed that after they became accustomed to the taste, the animals would drink more of this mixture than of pure water.

Roughage. The most common roughages fed to horses were barit (*Leersia hexandra* Siv.), culape (*Paspalum conjugatum* Berg), and carirawraw (*Digitaria corymbosa* (Roxb.) Merr. As these grasses are very palatable and fine in texture they are very much relished by the animals.

Other grasses and forage plants that were fed were aguingay (*Rottboellia exaltata* Linn. f.), Napier grass (*Pennisetum purpureum* Schum), Para grass (*Panicum barbinode* Trin.), corn forage, cogon (*Imperata cylindrica* Linn. Beauv.), Guinea grass (*Panicum maximum* Jacq.), *Dactyloctenium aegyptium* (Linn.) Richt, *Eleusine indica* (Linn.) Gaertn., *Panicum reptans* Linn., *Merremia emarginata* (Burm. f.) Hallier f, *Alternanthera sessilis* Linn., *Isachne debilis* Rendl., *Panicum colonum* Linn., and *Mimosa pudica* Linn.

Of the twenty-five horses studied, nine were pastured part of the day and the remaining sixteen were fed and cared for in a stable. All the horses fed in the stable all the time consumed on an average 22.24 kilograms of

roughage a head daily, the range being from 17.37 to 31.41 kilograms. Of the animals that were pastured, one was pastured every morning, while the other eight were pastured irregularly. As may be seen in table 3, horse No. 25 was pastured for only two days and only two hours a day, on an average, during the investigation, while horse No. 23 was pastured, on an average, 9.23 hours a day. The others were turned out in the pasture for periods intermediate between these figures.

No definite method of feeding the roughage was followed. The general rule was to give the horses roughage in amounts that they would consume when they came from work. There was observed a general tendency to give the horses an excessive amount of grass, which accounts for the pot-bellied appearance of many of them. Otherwise, roughage was given generally after grain feeding and before watering.

No special preparation of the roughage was made before feeding it, except with conrstalks, which were cut in short lengths to facilitate feeding and induce greater consumption.

Watering. The horses in this study were generally watered only twice a day, and horses Nos. 4 and 5 were not even watered days they were idle and the weather was rainy. Clean stream water was used in all cases.

Salting. Seven horses were salted, but irregularly. The salt was given in water when rice bran was not available. The other eighteen animals were not salted.

Work performed

The work performed by these horses is expressed in the number of kilometers covered in driving the animals. This valuation is but an approximation and is used here for practical purposes. Many factors, such as the size and kind of vehicle, the number of passengers carried, grade and nature of road surface, temperament of the driver, climate, etc., enter into the calculation of any standard value of work done by calesa horses.

It may be seen, in table 3, that the minimum amount of work done by any horse was on the average 4.3 kilometers a day. The maximum average distance covered daily was 21.9 kilometers. The general average distance made by all the twenty-five horses was 10.1 kilometers daily. The usual number of passengers carried was two.

Relation of feed consumption to work done and the condition of horses

During the 40 days of observation on each of the twenty-five horses only six recorded an increase in weight. The increase ranged from 0.5 kilogram to 3.6 kilograms. The weight of one horse remained stationary. The other eighteen had decreased in weight from 2.2 to 6.5 kilograms by the end of the period of observation. The six horses that registered increases in weight each received, on an average, 20.7 kilograms of roughage and 1.9 kilograms of concentrates daily, and each traveled, on an average, 12.6

kilometers daily. The horses that registered a decrease in weight each received, on an average, 20.8 kilograms of roughage and 0.8 kilogram of concentrates daily, and each traveled an average of 9.4 kilometers, daily.

Of special interest in this investigation are the cases of horses Nos. 6, 8, and 19; these animals performed a large amount of work and still had made gains in weight at the end of the investigation. Horses Nos. 6 and 8 belong to one owner, and the increase in weight indicated unusual ability on his part to care for and feed his horses. Horse No. 6 covered an average of 21.86 kilometers a day and had increased 2.4 kilograms in weight during the investigation. This animal received daily an average of 19.44 kilograms of roughage and 3.37 kilograms of concentrates. Horse No. 8 made an average of 12.6 kilometers a day and gained 1.4 kilograms in weight. The feed given to her daily amounted to an average of 20.33 kilograms of roughage and 2.83 kilograms of concentrates. Horse No. 19 covered an average of 16.7 kilometers a day and registered an increase of 2.3 kilograms during the investigation. He received daily an average of 20.53 kilograms of roughage and 3.25 kilograms of concentrates.

It may be seen also in table 3 that six horses did not receive any concentrate during the 40 days of observation, but traveled on an average 8.12 kilometers a day. This management resulted in reduction in weight amounting, at the end of the investigation, to an average of 5.18 kilograms a head.

The favorable effect of adequate feeding, especially grain feeding, is very apparent in these observations. Undoubtedly the reduction in weight of some of the horses was, in some measure, due to bad treatment received from cruel, inconsiderate drivers. It is not uncommon to see drivers whip their horses and jerk the reins unnecessarily, thus keeping the animal irritated and nervous. They often drive their horses faster than circumstances require. If the drivers were better trained, unquestionably, in many cases, the horses would be in a better condition.

Grooming

Eight horses were cleaned twice a day according to the general procedure of cleaning horses. The owners of nineteen horses used curry-comb and brush and the owners of seven horses used a *bao* (coconut shell) with serrated edges in place of curry-comb, and a piece of rag in place of a brush.

The horses were cleaned regularly but not as thoroughly as good care demands. Only the upper part of the body was cleaned leaving the legs and the belly and the head untouched, or only partly cleaned.

Bathing

All the horses, except two, were bathed some time during the period of investigation. Some animals were bathed every day for certain periods and the rest of the time only occasionally. Some of the horses were bathed only at long intervals. As a general rule, the horses were bathed after they

had performed strenuous work or when the body was so dirty as to require general cleaning. It was observed that soap was used in bathing six horses, especially in washing parts that were soiled with manure and materials of like nature. The brush was commonly used in the cleaning processes, but when the owner had none the *bao*, or coconut shell, was used. The horses were taken to the river for bathing.

Trimming of mane and tail, and clipping of body hair

As a general rule, the trimming of the mane and tail and the clipping of the body hair of the animals were not done regularly, consequently the horses investigated were seldom attractive in appearance.

During the period of observation only twelve horses were trimmed, and only once, none were clipped. Possibly this lack of clipping was due to the fact that this is usually done about the beginning of the dry season when the body hair of the horse is longest; this investigation was carried on during the rainy season.

Shoeing

Inasmuch as the period of observation on each animal was only for forty days, it was not possible to determine the interval at which each horse was shod. However, all the horses studied were shod once during the forty days of observation. Owing to the fact that all of these horses were driven on macadamized roads, there was no chance for the hoof to grow too long before the shoes wore out. The cost of shoeing horses in Los Baños is ₱0.25 a foot. One man who owned three horses did his own shoeing.

Stables

All the horses were found to be housed in insanitary stables. No solid floor was provided for the horses except in the case of four; most of the time the animals stood in mud and manure. In the case of four horses the condition was worse, as they were tied to trees without any provision being made for shelter. The stable of one horse was found to be sanitary and safe for the horse, and gave sufficient freedom for the animal to move around.

SUMMARY OF OBSERVATIONS

1. Twenty-five calesa horses owned and used in Los Baños Municipality were observed in this study, eighteen of which were stallions, five were mares, and two were geldings.

2. The average age of the horses was 6.76 years, the range being from 3 to 14 years.

3. The average height was 123.76 centimeters (48.72 in.) and the average weight, 206.06 kilograms (454.28 lbs.)

4. The horses were generally fed three times a day—morning, noon, and afternoon.

5. The common concentrates given to the horses were rice bran and corn, and occasionally rough rice.

6. The common roughages given to the horses were barit (*Leersia hexandra* Siv.,), culape (*Paspalum conjugatum* Berg), carirawraw (*Digitaria corymbosa* Roxb.), corn forage, and mixed pasture grasses.

7. The average consumption of roughage by unpastured horses was 22.24 kilograms a head a day.

8. The average consumption of grain by horses fed concentrates regularly was 2.3 kilograms a head a day.

9. There was no regularity in the feeding of roughage or grain.

10. The horses were generally watered only twice a day after feeding.

11. The animals were salted sparingly and irregularly, and a number received none at all.

12. The average distance covered by the horses was 10.14 kilometers a day.

13. Twenty-four per cent of the horses had increased in weight and seventy-two per cent had decreased in weight at the end of observation. Four per cent did not change in weight.

14. The curry-comb and the brush were generally used for cleaning the horses. Grooming was done in a haphazard way.

15. The horses were bathed very irregularly.

16. The trimming of horses was done only occasionally.

17. The horses were shod at reasonable intervals.

18. Very poor and insanitary stables were provided for the horses.

TABLE 1

Showing sex, color, age, and size of horses

HORSE NO.	SEX	COLOR	AGE[a]	HEIGHT	INITIAL WEIGHT
			years	*cm.*	*kgm.*
1	Stallion	Bay	6	128.2	214.6
2	"	Black	3	125.4	195.9
3	"	Cream	5	118.2	190.9
4	"	Buckskin	4	120.3	198.2
5	"	Black	8	124.5	201.3
6	Gelding	Bay	8	134.3	248.1
7	Stallion	Skewbald	3	128.0	202.2
8	Mare	Roan	8	123.2	193.0
9	Stallion	Buckskin	5	121.5	217.2
10	"	"	7	127.0	218.0
11	Gelding	Bay	10	128.1	251.0
12	Stallion	Buckskin	6	125.3	230.2
13	"	Gray	14	115.2	192.7
14	"	Bay	6	119.0	173.6
15	Mare	Bay	10	125.5	227.4
16	Stallion	Buckskin	9	126.0	204.5
17	"	"	8	126.5	201.3
18	"	Black	7	117.0	187.3
19	"	Bay	5	121.5	236.3
20	"	Skewbald	11	120.2	184.5
21	Mare	Gray	6	120.5	186.2
22	Stallion	Buckskin	4	124.0	205.0
23	Mare	Bay	8	118.2	197.0
24	Stallion	Gray	3	128.0	190.0
25	Mare	Bay	6	128.5	205.2
Average.....			6.80	123.76	206.06

[a] The age was obtained from the certificate of ownership.

TABLE 2

Showing proximate constituents of feeds used[a]

SAMPLE	MOISTURE	CRUDE FATS	ASH	PROTEINS	CRUDE FIBER	CARBOHYDRATES	CALORIFIC VALUE PER 100 GRAMS
				Concentrates			
Rice bran No. 1[b]	11.51	3.52	14.16	7.60	25.86	37.35	215
Rice bran No. 2	13.26	9.30	14.78	8.19	13.06	41.41	290
Corn	15.68	3.41	1.81	8.19	1.72	69.19	350
Molasses	55.10	0.15	3.47	0.78	———	———	———
				Roughage			
Barit (*Leersia hexandra* Siv.)	70.91	1.55	4.63	1.81	8.70	12.40	70
Corn fodder	17.83	0.66	1.52	0.60	4.63	74.76	315
Culape (*Paspalum conjugatum* Berg)	69.05	0.67	3.19	1.82	8.54	16.73	80
Guinea grass	66.43	0.83	4.28	1.25	11.52	15.69	75
Carirawraw (*Digitaria corymbosa* Roxb.)	71.57	0.76	4.42	2.01	8.38	12.86	70
Napier grass	80.16	1.17	3.70	2.28	4.97	7.72	50
Aguingay (*Rottboellia exaltata* Linn. f.)	63.88	1.17	4.57	3.38	10.81	17.19	90
Pasture grasses	70.82	2.56	3.23	3.03	9.48	10.88	80

[a] Analysis performed in Analytical Laboratory, Chemistry Department, College of Agriculture.

[b] This kind of rice bran is rougher and less palatable than rice bran No. 2.

TABLE 3

Showing average daily feed consumption and pasturage, daily work performed, and condition of horses at end of investigation

HORSE NO.	ROUGHAGE		CONCENTRATES		PASTURAGE		WORK DONE	GAIN OR LOSS IN WEIGHT
	Day	Night	Day	Night	Days	Hours a day		
	kgm.	*kgm.*	*kgm.*	*kgm.*			*km.*	*kgm.*
1	7.97	11.51	1.05	0.55	——	——	16.55	−3.2
2	6.45	10.92	1.07	0.37	——	——	13.75	−2.7
3	9.60	13.18	0.76	0.04	——	——	16.82	+0.5
4	8.97	11.54	0.68	0.01	——	——	14.50	−6.4
5	15.86	15.55	0.14	——	——	——	6.00	−3.2
6	9.55	9.89	0.92	2.45	——	——	21.85	+2.4
7	14.55	15.07	0.58	0.11	——	——	9.45	−4.6
8	10.70	9.63	0.50	2.33	10	3.40	12.60	+1.4
9	9.79	11.44	0.50	0.50	3	2.33	6.80	−5.2
10	8.36	11.34	——	——	21	2.10	7.58	−5.5
11	3.56	6.03	0.42	0.64	38	5.55	5.10	−3.0
12	7.60	8.38	0.41	0.75	16	4.93	5.03	−3.2
13	9.06	14.18	0.76	0.88	——	——	11.92	−2.2
14	9.29	10.86	0.73	0.88	——	——	9.00	−6.5
15	9.79	11.69	0.68	0.98	——	——	12.85	−3.4
16	11.29	11.31	0.63	0.50	3	1.33	6.45	same
17	11.97	13.38	——	——	7	2.71	7.77	−4.0
18	10.65	11.71	0.63	0.55	——	——	4.75	+3.6
19	10.22	10.31	2.00	1.25	——	——	16.70	+2.3
20	11.62	12.07	——	——	——	——	7.85	−6.0
21	11.36	11.61	——	——	——	——	7.05	−5.2
22	10.93	11.21	0.51	0.51	——	——	10.40	−3.0
23	——	10.88	——	——	40	9.23	8.05	−4.0
24	9.48	9.27	0.14	0.16	——	——	4.35	+3.5
25	9.61	10.98	——	——	2	2.00	10.40	−6.4
Average.	9.93	11.36	0.69	0.75	15.6	3.73	10.14	−2.67

THE CHEMICAL COMPOSITION OF PHILIPPINE FISHES[1]

AMADO N. BALAGTAS

INTRODUCTION

Importance of fish in the diet

Fish occupies an important place in the Filipino dietary. Filipinos, in general, especially those living along the sea coasts and interior rural districts, subsist largely on rice, fish, and vegetables. Even in the cities, fish is always in great demand. According to the Statistical Bulletin of the Philippine Islands (1925) the capital invested in fisheries in 1918 was ₱9,613,907 and the value of the catch amounted to ₱8,692,401. In spite of this large amount of invested capital, the importation of fish in the same year was ₱5,212,350. (Census of the Philippine Islands, 1921.)

The results of the investigation reported by Roxas (1922) show that the diet of the Filipinos is probably deficient in proteins. As fish is the principal source of protein supply in their diet, the importance of knowing which fishes are best for food is obvious.

Gibbs and Agcaoili (1912) reported some analyses of dried fishes and some minor Philippine fish foods, as *bagoong*, etc., but no publication on the chemical composition of fresh Philippine fishes is available. Adriano and Tavanlar (1925) in their study of Philippine foods determined the calcium oxide content of the ash of some fishes.

Object of the present work

This work was undertaken to find the possible nutritive value of some Philippine fishes.

Time and place of the present work

This work was begun in April, 1926, and closed in February, 1927. All analyses were performed in the Advanced Laboratory of the Department of Agricultural Chemistry, College of Agriculture, Los Baños.

MATERIALS AND METHODS

Description of materials

Most of the materials used were obtained from the local (Los Baños) and Manila markets. A few species were secured from Pampanga.

[1] Thesis presented for graduation, 1927, with the degree of Bachelor of Science in Agriculture from the College of Agriculture No. 270; Experiment Station contribution No. 549. Prepared in the Department of Agricultural Chemistry under the direction of Dr. F. O. Santos.

Samples from Manila and Pampanga were packed in ice to prevent decomposition. The sampling was done within 24 hours after the fish were caught.

The samples were identified by H. R. Montalban, of the Bureau of Science.

The following descriptions of the materials apply to the representative samples preserved for identification.

References on the distribution of fish were taken from Seale's *The Fishery Resources of the Philippine Islands* (1908).

Anchovy (*Anchovia commersoniana* Lacépède); dilis (Tag.); monamon (Ilocano); anak-bat (Moro). This species is the most common of all the anchovies found in the Philippine waters. It is found in great numbers along the shores of the islands. This fish is usually dried or made into *bagoong*.

The sample preserved was a small fish 10 cm. in length and 1.1 cm. in width. The body was almost transparent with very thin scales. The head was small. The sample weighed 7 grams.

Barracuda (*Sphyraena acutipinnus* Day). Barracuda abounds in all Philippine waters. It can be found in the Manila markets throughout the year.

The body of the preserved sample was long and cylindrical, measuring 20 cm. in length and 2 cm. in width. It was covered with small scales. The weight of the sample was 37 grams.

Barracuda (*Sphyraena jello* Cuv. et Val.); babayo (Tag.). Barracuda is a salt water fish. It is one of the largest fish found in Manila markets. It is seldom sold whole, but in cut portions.

The body of the preserved sample was slightly compressed laterally. It measured about 49 cm. in length and 8.5 cm. in width. The body was covered with white scales. The head was small. The sample weighed 573 grams.

Bastard shad (*Konosirus thrissa* Osbeck); kabasi (Tag.). This fish can be procured in Manila markets at any time of the year. Large numbers are caught in Manila Bay. They are sold either fresh or smoked (*tinapa*).

The sample preserved was laterally compressed and measured 20 cm. in length and 8 cm. in width. It was covered with white scales. The weight of the sample was 110 grams.

Caesio (*Caesio chryeozona* Kuhl and Van Hassell); dalagang-bukid (Tag.). This is a salt water fish.

The preserved sample measured 20 cm. long and 5.5 cm. wide. It was slightly compressed laterally. The dorsal surface was pink. The head was small. The sample weighed 93 grams.

Catfish (*Arius* sp.); kandule (Tag.); gagúe (Moro). This fish lives in both salt and fresh water lakes and rivers. It is found in all parts of the

Islands. On account of a peculiar feeding habit, it is not much liked by the well-to-do Filipinos.

The preserved sample was cylindrical in form and measured 36 cm. in length and 6.5 cm. in width. It is a scaleless fish but the skin is thick, dark on the dorsal surface and white ventrally. The head is large in comparison with the size of the body. The sample weighed 227 grams.

Catfish (*Clarias batrachus* Linn.); hito (Tag.). This variety of fish is abundant in small ponds and rice paddies where water remains stagnant for some time. It is widely distributed in the Islands. It is a fresh water fish.

This is a black, scaleless cylindrical fish. The preserved sample was 30 cm. long and 4.5 cm. wide. The head was rather large in proportion to the body. The sample weighed 143 grams.

Climbing perch (*Anabas testudineus* Bloch); tinikan (Tag.); liualu (Pamp.). This fish is common in all parts of the Islands. It inhabits fresh water lakes and rivers, usually the shallows.

The body of the sample was laterally compressed and was covered with green scales. It was 12 cm. long and 4 cm. wide. The head was moderately large in comparison with the body. The sample weighed 30 grams.

Croaker (*Johnius belengeri* Cuv. et Val.); abo (Visayan). The croaker is most abundant along the shores of the Southern Islands. It is a salt water fish.

The sample measured about 16 cm. in length and 4.5 cm. in width. The body was laterally compressed. The head was small and the body was covered with small scales. The sample, preserved, weighed 57 grams.

Drepane (*Drepane punctata* Gmelin); mayang (Tag.). This is a salt water fish found in almost all parts of the Islands.

The sample was almost circular in form and compressed laterally. It was 12 cm. long and 10 cm. wide. The body was covered with dirty green scales with irregular black spots on both sides. The weight of the sample was 75 grams.

Drum (*Umbrina russelli* Cuv. et Val.); apahap (Tag.). This is one of the most important commercial fish in the Philippines. It is abundant in rivers and in most Philippine bays and seas. It is one of the fishes that brings the highest price in the market.

The preserved sample was compressed laterally. It was broad and covered with large white scales. It was 35 cm. long and 10 cm. wide. The head was small in proportion to the body. This sample weighed 573 grams.

Flathead (*Platycephalus indicus* Linn.); sunog (Tag.); biang-sudsod (Pamp.). It is found in Philippine lakes and rivers all the year round.

The body of the sample was a little flat dorso-ventrally. It was 33 cm. long and 4 cm. wide at the region of the trunk. The dorsal surface was dark with a green tinge, the ventral was white. The head was flat and moderately small. The weight of the preserved sample was 201 grams.

Flounder (*Pseudorphombus neglectus* Bleeker); palad (Tag.). This fish is widely distributed and is found in large numbers along the shores of the Ilocos provinces.

The preserved sample was laterally compressed and was covered with fine brown scales. The length was 14 cm. and the width, 7 cm. The sample weighed 24 grams.

Goby (*Glossogobius giurus* Hamilton-Buchanan); biang-puti (Tag.); kolapo (Moro). This fish is one of the most common species of the family Gobiidae. It is found in all parts of the Islands; is especially abundant in fresh-water lakes and rivers where it is caught with drift nets and by hook and line. It is also taken in lakes and rivers where the water is brackish.

The body of the preserved sample was cylindrical and covered with light yellow scales. The length was 22 cm. and the width, 4.5 cm. The head was moderately large. It weighed 81 grams.

Goby (*Oxyurichthys opthalmonema* Bleeker); tuñggo (Tag.); biang-cuayan (Pamp.). This fish is abundant in rivers where it is caught in large quantities. It is cheap and is usually made into *bagoong*.

The sample was a small fish, measuring 11 cm. in length and 1.5 cm. in width. The body was covered with fine scales and the head was moderately small. The weight of the fish was 7 grams.

Grunt (*Pristopoma hasta* Bloch); ayuñgin (Tag.); lagohot (Moro); licauc (Pamp.). This fish is always for sale in the Manila markets. Although it is a salt water fish, it is found in abundance in Laguna de Bay, a fresh water lake.

The preserved sample was a small fish about 7 cm. long and 4.5 cm. wide. It was laterally compressed. The body was covered with dirty green scales. The head was small. The weight of the sample was 21 grams.

Grunt (*Pomadasis argyreus* Cuv. et Val.); besugo (Tag.). The sample was a small fish measuring 8.5 cm. in length and 2.5 cm. in width. It was laterally compressed and the body was covered with scales. The head was large in proportion to the body. The sample weighed 14 grams.

Half-beak (*Hemiramphus* sp.); buguing (Tag.). The body of the preserved sample was cylindrical and measured 23 cm. in length and 2 cm. in width. The head was small with a long snout. The weight of the sample was 34 grams.

Herring (*Harengula moluccensis* Bleeker); tunsoy (Tag.); tamban (Moro). This is a salt water fish. It is found along the shores of all the islands. Large numbers are caught in Manila Bay throughout the year, with especially heavy catches during May and June.

The sample was compressed laterally. It was 11 cm. in length and 2.2 cm. in width. The head was small and the body was covered with white scales. The weight of the sample preserved was 10 grams.

Japanese mackerel (*Scomber japonicus* Houttuyn); hasa-hasa (Tag.). It is found in all shoals in the Islands and comes to Manila Bay in March.

It is rarely caught in inland rivers. This species is especially common about the Cuyo group of islands and along the shores of Palawan. It is one of the popular food fish, always selling readily in the market.

The body of the sample was white and compressed laterally. It was about 15 cm. in length and 5 cm. in width. The head was large in proportion to the body. The sample weighed 41 grams.

Leather Jack (*Scomberoides tol* Cuv. et Val.); cas-sisung (Tag.); lapis (Pamp.). This is a salt water fish caught in quantities in the South China Sea about the region of Palawan.

The sample was broad, compressed laterally and covered with fine yellow scales. It was 37 cm. long and 15 cm. wide. Its head was large. The sample weighed 655 grams.

Marine eel (*Muraenesox cinereus* Forskol); palos (Tag.). This eel is primarily a marine species, but it also occurs in great abundance in the mouth of rivers, migrating up stream as far as the tides are felt.

The body of the preserved sample was cylindrical and measured 38 cm. in length and 2 cm. in width. The head was small and the body devoid of scales. The weight of the sample was 42 grams.

Milkfish (*Chanos chanos* Forskol); bañgos (Tag.); bangellus (Moro). The milkfish is one of the most important commercial fish in the Philippines. It ranges from the northern to the southern part of the Islands. It is raised in ponds which occupy thousands of hectares of land. As the fish lives in salt water, the ponds are located along the banks of brackish rivers and shores of bays and seas.

The sample preserved measured about 23 cm. in length and 7 cm. in width. The body was covered with white scales and was slightly compressed laterally. The sample weighed 391 grams.

Mudfish (*Ophicephalus striatus* Bloch); dalag (Tag.); bundaqui (Pamp.). This fish is found in fresh water lakes, small ponds and other low places where there is water. Large numbers are caught in rice fields during the rainy season. This fish is widely distributed in the Islands and is much liked by Filipinos.

The preserved sample was cylindrical and covered with black scales along the dorsal surface and with white scales along the abdominal region. It was 31 cm. long and 5 cm. wide. The head was large. The weight of this sample was 235 grams.

Mullet (*Mugil cephalus* Linn.); banak (Tag.); balanak (Pamp.). The mullet is the most common species belonging to the family Mugilidae that is found in the Philippines. It feeds on vegetables and is migratory in habit.

The sample was 15 cm. long and 5 cm. wide. It was slightly laterally compressed. The body was covered with white scales. The head was small in proportion to the body. The sample weighed 96 grams.

Nemipterus (*Nemipterus* sp.); kulisig (Tag.). The body of the preserved sample was compressed laterally and covered with scales. It was 9.5 cm. in length and 2.5 cm. in width. The head was moderately small. The weight of the sample was 12 grams.

Pompano (*Caranx malabaricus* Bloch and Schneider); talakitok (Tag.). This is a salt water fish and is one of the most important commercial fish in the Islands. It is plentiful in Manila markets.

The preserved sample was compressed laterally, measuring 12 cm. in length and 5 cm. in width. The head was large in proportion to the body. The sample weighed 26 grams.

Porgy (*Sparus calamara* Russell); bakoko (Tag.); gaud-gaud (Moro). This fish is plentiful in Manila markets. It is caught in rivers and lakes with hook and line and with nets.

The body of the sample preserved was laterally compressed and covered with white scales. The length was 14 cm. and the width 8 cm. The sample weighed 85 grams.

Sardine (*Sardinella longicops* Cuv. et Val.); tamban (Tag.). This species of Clupeidae, as the tunsoy, is common in Manila Bay during some seasons of the year; it is most abundant during the months of May and June. This fish is usually smoke-dried and sold as *tinapa*.

The length of the preserved sample was 16 cm. and the width 3.5 cm. The body was laterally compressed and covered with white scales. The sample weighed 46 grams.

Scatophagus (*Scatophagus argus* Gmelin); kitang (Tag.). This fish lives in both salt and fresh water. It is found along the shores of all the islands.

The preserved sample was almost circular in shape and laterally compressed. It was 9 cm. long and 6 cm. wide. The head was small and the body covered with fine scales. The skin was thick. The color was dirty green with black spots on either side of the body. The sample weighed 22 grams.

Snapper (*Hemipterus japonicus* Bloch); kulisic (Tag.). The snappers are found in all Philippine waters but are most abundant in the southern waters along the coast of Zamboanga.

The preserved sample was compressed laterally, measuring 15 cm. in length and 4.5 cm. in width. The head was rather large in proportion to the body. The sample weighed 45 grams.

Tarpon (*Megalops cyprinoides* Broussonet); buan-buan (Tag.). This little pink fish is abundant in Manila Bay. It is an important commercial fish and much liked as food.

Therapon (*Therapon puta* Cuv. et Val.); bugaong (Tag.). This is a salt water fish.

The sample preserved was laterally compressed. It was 12 cm. long and 3 cm. wide. The head was small and the body was covered with fine

scales. Two dark lines run lengthwise on each side. The sample weighed 19 grams.

Methods of analysis

The methods used for the different analyses were taken from the Official and Tentative Methods of Analysis compiled by the Association of Official Agricultural Chemists (1920).

Sampling. To prevent any considerable loss of moisture, sampling was done as quickly as possible. The fish were prepared while fresh.

Several fish were weighed, the number depending on the size of the materials used. Then the scales, fins, head, and internal organs were removed. The flesh was sliced dorso-ventrally. The weight of the vertebral column and the adhering ribs was excluded from the weight of the edible portion.

The flesh thus obtained was weighed and ground in a meat grinder into fine particles and then thoroughly mixed. This ground material was quartered and a representative sample was taken for analysis.

Edible portion. Analyses were made of the edible portion only. The percentage of the edible portion was computed by taking the initial weight of the whole fish and the final weight of the flesh obtained therefrom. From the data obtained, the percentage of edible portion was calculated.

Moisture. Approximately 2 to 10 grams of the samples were weighed in a crucible and dried to constant weight between 100° and 105° C. The loss in weight from drying is the moisture.

Ash. The moisture-free samples in moisture determination were ignited until the residue was free from carbon particles. The difference between the weight of the ash plus the crucible and the constant weight of the crucible represents the ash.

Crude fiber. The weighed samples (5 to 10 grams) were placed in a 500 cc. reflux flask and boiled for 30 minutes with 200 cc. of 1.25 per cent sulfuric acid solution. The mixture was filtered through a cloth filter, and the residue washed until free from acid. The residue was returned to the same flask and treated with 200 cc. of 1.25 per cent boiling sodium hydroxide solution. Boiling was continued for 30 minutes. The residue was again filtered and washed until free from alkali, and was then transferred to tared dishes and dried to constant weight. The residue was ignited until free from carbon particles and then weighed. The difference between the first constant weight and the weight after ignition is the crude fiber.

Proteins. The weighed samples (2 to 5 grams) were placed in Kjeldahl flasks and treated with 30 cc. H_2SO_4 and 12 grams of the salt mixture consisting of 10 grams K_2SO_4 and 2 grams $CuSO_4$. The acid mixture was digested until clear. After cooling, 300 cc. water were added to the mixture. Enough saturated sodium hydroxide solution was added to make the mixture moderately alkaline. Pieces of mossy zinc were added, and the mixture then distilled. The distillate was collected in a receiving flask containing 50 cc. of standard acid. The excess acid was titrated with the standard sodium hydroxide solution using methyl orange as indicator. The per-

centage of nitrogen thus obtained was multiplied by 6.25 to get the percentage of protein in the sample.

Crude fats or ether extract. Samples of about 2 to 5 grams were weighed in paper thimbles and dried to constant weight. The fat was extracted in the Soxhlet extractor for about 16 hours. Extraction for longer than 16 hours was found unnecessary. The fat free residue in the paper thimbles was then dried to constant weight. The difference between the first and the second constant weights is the crude fats or ether extract.

Carbohydrates or nitrogen free extract. Carbohydrates were obtained by subtracting from 100 the sum of the percentages of moisture, ash, crude fats, crude fiber, and proteins. All undetermined constituents were thus considered as carbohydrates.

Calorific value. The amount of heat or energy liberated by a certain food represents its calorific value. For the calculation of the calorific values, the factors given by Rubner for the fuel values of the different food constituents were used:

Fats	9.3	calories per gram
Carbohydrates	4.1	" " "
Protein	4.1	" " "

Total nutrients. Total nutrients are the sum of the percentages of ash, fats, carbohydrates, and proteins (Langworthy, 1907).

Nutritive ratio. The nutritive ratio represents the ratio between percentage of fats multiplied by 2.25 plus the percentage of carbohydrates and the percentage of proteins.

$$\text{Nutritive ratio} = \frac{(\text{Percentage fats} \times 2.25) + \text{percentage carbohydrates}}{\text{Percentage proteins}}$$

RESULTS

The results of the analyses are given in table 1. The values given are averages of six concordant determinations.

1. Almost 50 per cent of the weight of fish is refuse. Those fish having more or less cylindrical shape contain the higher percentage of edible portion.
2. The percentage of fat decreases as the moisture increases and vice versa.
3. If present, carbohydrates are of insignificant amount in fish.
4. Fish is essentially a nitrogenous material. The protein content is about one-fifth of the total weight of the flesh.

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TABLE 1

Showing the chemical composition of fresh fishes

SAMPLE	EDIBLE PORTION	REFUSE	MOISTURE	ASH	ETHER EXTRACT OR CRUDE FAT	PROTEIN (N×6.25)	CARBOHYDRATES	TOTAL NUTRIENTS	CALORIES PER 100 GRAMS	NUTRITIVE RATIO
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
e; dilis (Tag.[a]); monamon (Ilocano); anak-bat (Moro) .	72.36	27.65	79.42	1.24	0.70	18.15	0.49	20.58	80	0.11
.....	67.88	32.12	77.86	1.46	3.45	18.63	——	23.54	110	0.42
abayo (Tag.).....	64.33	35.67	76.74	1.50	1.37	20.63	——	23.50	95	0.15
basi (Tag.).....	55.81	44.19	73.72	1.83	4.32	20.00	0.13	26.28	125	0.49
Hassell; dalagang-bukid (Tag.).....	65.12	34.88	79.38	1.21	0.70	19.44	——	21.35	85	0.08
Moro).....	47.14	52.86	79.07	1.49	1.45	17.60	0.39	20.93	90	0.21
).....	56.51	43.49	76.34	1.16	4.75	17.66	0.09	23.66	115	0.61
tinikan (Tag.); liualu (Pamp.[b])	44.56	55.44	75.19	1.97	5.11	18.56	——	25.64	125	0.62
o (Visayan).....	48.05	51.95	80.90	1.47	1.69	17.40	——	20.56	90	0.22
g (Tag.).....	46.29	53.71	79.69	1.23	1.60	19.44	——	22.27	95	0.19
ap (Tag.).....	54.45	45.55	77.17	1.22	1.68	19.93	——	22.83	95	0.19
g (Tag.); biang-sudsod (Pamp.).....	58.30	41.70	78.41	1.38	1.80	19.47	——	22.65	95	0.21
r; palad (Tag.).....	49.55	50.45	80.13	1.56	0.49	17.42	0.40	19.87	80	0.09
nan; biang-puti (Tag.); kulapo (Moro).....	58.10	41.90	79.36	1.46	2.17	17.13	——	20.76	90	0.29
tuñggo (Tag.); biang-cuayan (Pamp.).....	67.50	32.50	81.82	1.91	1.08	15.41	——	18.40	75	0.16
ag.); lagohot (Moro); licauc (Pamp.).....	47.04	52.96	79.76	1.56	0.69	18.62	——	20.87	80	0.08
sugo (Tag.).....	40.54	59.46	75.64	3.52	0.92	17.69	2.23	24.36	90	0.24
;).....	60.44	39.56	77.41	1.38	1.24	20.56	——	23.18	95	0.14
nsoy (Tag.); tamban (Moro).....	67.54	32.46	79.36	1.65	2.45	16.40	0.14	20.64	95	0.35
tuyn; hasa-hasa (Tag.).....	47.94	52.06	75.30	1.51	2.26	21.42	——	25.19	110	0.24
; cas-sisung (Tag.); lapis (Pamp.).....	48.02	51.98	77.70	1.70	1.18	19.44	——	22.32	90	0.14
alos (Tag.).....	50.59	49.41	80.28	1.61	0.54	17.78	——	19.93	80	0.07
ag.); bangellus (Moro).....	67.60	32.40	73.54	1.28	3.46	21.40	0.32	26.46	120	0.38
(Tag.); bundaqui (Pamp.).....	53.92	46.08	77.23	1.31	1.48	20.08	——	22.87	95	0.17
; balanak (Pamp.).....	55.79	44.21	76.25	1.36	4.33	18.44	——	24.13	115	0.53
.....	45.46	54.54	78.43	1.87	1.88	17.67	0.15	21.57	90	0.25
chneider; talakitok (Tag.).....	50.63	49.37	73.28	1.73	6.25	18.50	0.24	26.72	135	0.77
ag.); gaud-gaud (Moro).....	52.56	47.44	75.78	1.34	1.90	20.96	0.02	24.22	105	0.21
tamban (Tag.).....	63.83	36.17	75.29	1.60	2.61	19.21	1.29	24.71	110	0.37
tang (Tag.).....	38.36	61.64	77.47	2.06	2.31	15.59	2.57	22.53	95	0.50
ic (Tag.)	48.81	51.19	76.55	1.57	4.68	18.02	——	24.27	115	0.58
uan-buan (Tag.).....	50.00	50.00	75.76	1.97	4.19	18.96	——	25.12	115	0.50
ong (Tag.).....	50.00	50.00	75.40	2.52	2.48	19.72	——	24.72	105	0.28

mpango.

Anchovy, *Anchovia commersoniana* Lacépèd
Barracuda, *Sphyraena acutipinnus* Day. . . .
Barracuda, *Sphyraena jello* Cuv. et Val.; b
Bastard shad, *Konosirus thrissa* Osbeck; ka
Caesio, *Caesio chryeosona* (Kuhl and Van H
Catfish, *Arius* sp.; kandule (Tag.); gague (
Catfish, *Clarias batrachus* Linn.; hito (Tag.
Climbing perch, *Anabas testudineus* Bloch;
Croaker, *Johnius belengeri* Cuv. et Val.; ab
Drepane, *Drepane punctata* Gmelin; mayan
Drum, *Umbrina russelli* Cuv. et Val.; apah
Flathead, *Platycephalus indicus* Linn:; sunc
Flounder, *Pseudorphombus neglectus* Bleeke
Goby, *Glossogobius giurus* Hamilton-Bucha
Goby, *Oxyurichthys opthalmonema* Bleeker;
Grunt, *Pristopoma hasta* Bloch; ayuñgin (T
Grunt, *Pomadasis argyreus* Cuv. et Val.; b
Half-beak, *Hemiramphus* sp.; buguing (Ta
Herring, *Harengula moluccensis* Bleeker; tu
Japanese mackerel, *Scomber japonicus* Hou
Leather Jack, *Scomberoides tol* Cuv. et Val.
Marine eel, *Muraenesox cinereus* Forskol; p
Milkfish, *Chanos chanos* Forskol; bañgos (T
Mudfish, *Ophicephalus striatus* Bloch; dala
Mullet *Mugil cephalus* Linn.; banak (Tag.)
Nemipterus, *Nemipterus* sp.; kulisig (Tag.)
Pompano, *Caranx malabaricus* Bloch and S
Porgy, *Sparus calamara* Russell; bakoko (T
Sardine, *Sardinella longicops* Cuv. et Val.;
Scatophagus, *Scatophagus argus* Gmelin; ki
Snapper, *Hemipterus japonicus* Bloch; kulis
Tarpon, *Megalops cyprinoides* Broussonet;
Therapon, *Therapon puta* Cuv. et Val.; bu

[a] Tag. = Tagalog. [b] Pamp. = P

NOTES ON AN OUTBREAK OF POULTRY EPIDEMIC[1]

FRANCISCO GO KEE, M. D.

A very contagious avian disease broke out in Baclaran Poultry Farm in February, 1928. In less than two months, 2,700 of the chickens, mostly laying hens and young pullets, died. This farm is situated on the Manila South Road midway between the towns of Parañaque and Las Piñas, province of Rizal, about a quarter of an hour by automobile from Manila. The farm has been running for about six or seven years.

The stock consists principally of Cantonese chickens, the majority of which originated from the improved Cantonese strain of the College of Agriculture, and the rest were from strains directly imported from Amoy, China. The stock during the last three years had never numbered less than one thousand, and after the hatching season, 1927–28, it totalled about three thousand fowls. It is estimated that the entire place is capable of maintaining about 5,000 layers, so that when the epidemic occurred, the farm was not over-stocked.

There were a few Silkie, Barred Plymouth Rock, and White Leghorn chickens in the place. A few Native pigeons were kept in an open pigeon house adjacent to the laying houses.

Symptoms of disease that broke out on the farm. There was loss of appetite, marked thirst, and dopiness. A thick tenacious mucous was discharged from the beak and nostrils; the nostrils were later plugged up with dried secretions. There was also marked conjunctivitis, the birds gasped for breath. There was a nervous twitching of the head. The comb and the rest of the head became purplish. The chickens assumed a sitting posture when signs of heavy breathing became more marked.

The temperature was above normal, 41.4°C. (106.7°F.), both morning and afternoon during the first three or four days. If the chickens did not die, the temperature dropped to 40.0°C. (104.0°F.) on the sixth or seventh day. The crop became distended with gas, and there was marked diarrhea with white fecal discharge. In spite of the purging the sick bird maintained its weight. The disease attacked the adult birds that

[1] These notes were sent to me by Doctor Go Kee, a practicing physician in Manila and proprietor of the Baclaran Poultry Farm. They are here published for the benefit of other poultry raisers. Doctor Go Kee, a busy man in his profession, finds in his poultry business much diversion and usually fair profit. He avails himself of recent developments and discoveries in Poultry Husbandry. He has faith in the industry. The hard luck of the past months as given in these notes has in no way discouraged him. He is restocking his farm and hopes in two years to have his industry back on its January, 1928, basis, or better.
—F. M. Fronda, *of the Department of Animal Husbandry.*

were at the height of their productive stage; the younger birds were less susceptible.

The course of the disease was two weeks. The few chickens that recovered without treatment have one of the legs paralyzed. This paralysis is unilateral, never bilateral. Even if the bird recovered, apparently, there remains a slight habitual twitching of the head.

Treatment tried. While the scourge was raging, we brought twenty cases, all Cantonese layers, to our clinic (205 Calle Soler, Manila) for observation and treatment.

These birds were fed with a mixture of native onions and green pepper three times a day. Quinine bisulfate powder, mixed with water, at the rate of two grains a bird, was given three times a day. The birds were given plenty of food and fresh water was open to them at all times.

Six of the chickens that were thus treated died in the course of three or four days, and fourteen of them recovered at the end of two weeks. Those that recovered, we still keep on the farm and they lay eggs, although the number is below normal. One hen is still kept (July) in a separate coop and is suffering from paralysis of one leg. She is able to feed herself, however, and is capable of laying on the average, two eggs a week.

Autopsy. The crop of the birds that died of this disease was filled with gas and mucous. The gastro-intestinal tract was usually empty, the serosa showing a white glistening appearance, and the mucosa characterized by petechial hemorrhage. The ovaries of the hens were filled with a creamy, caesous material, which on bacteriological examination was found to contain *Staphylococcus albus* and *aureus*. The heart and liver showed slight congestion with petechiae. The other organs of the body were apparently normal.

Transmission. The disease is transmitted by the water in the common drinking troughs becoming contaminated by the mucous discharge of a sick bird. Healthy chickens confined in separate coops and kept near the sick birds, but with separate drinking troughs did not contract the disease. We saw healthy birds picking and eating the feces of the sick birds and fearing that these might be contaminated they were isolated immediately and kept under observation. They did not contract the disease. Forty adult chickens that were thus isolated were saved.

Compared with the other breeds on the Baclaran Poultry Farm, the White Leghorn chickens were very susceptible to this particular disease. Then in order of susceptibility were the Barred Plymouth Rocks, Rhode Island Reds, and the Cantonese. After many birds had died, some of the sick chickens were placed with forty healthy ducks (White Pekingese) and fifteen Native pigeons, and two "rice birds", but there were no ill results.

How the Baclaran flock became infected. Here, we can only theorize. It is inconceivable that the disease can be carried any great distance, as the

virus dies out very quickly. The epidemic has been in the neighborhood of the farm for quite a long while, but not a sign was noticed in the flocks till about the middle of February, 1928. The farm is very well fenced, so that no animal of any kind can get in. Customers coming to buy poultry and eggs are not allowed in the poultry yards, hence the chances of infection coming through this source may be considered negligible. It was suspected that neighbors envious of the good health of the Baclaran fowls while their chickens were dying, might have thrown into the farm yard some of their dead chickens. Birds, as the barnyard sparrows, might also have introduced the disease. After the infection got in, it spread like a fire. Preventive measures could not be taken, the disease spread too rapidly.

EXTENSION DIVISION NOTES

Prepared by Moises M. Kalaw under the supervision of Prof. I. Elayda, Director of Extension Service

The Tuyo (dried fish)

Persons who are used to having the common *tuyo* for their principal breakfast dish or as an appetizer for other meals, look for it wherever they happen to sojourn in the Philippines. Dried fish can be found in almost any town in the Philippines—sun-drying being the most common way in the Islands of preserving fish—but in places far from Manila the popular *tuyo* as made in Bataan and sold in the Manila markets and in provinces getting their supply from Manila is not often on sale. For example in several town markets in the Bicol region as well as in the Visayan Islands there is for sale plenty of what is called *tuyo* but it lacks decidedly the taste and the state of preservation of the Bataan *tuyo*. And yet the dried fish so lacking in taste exhibits practically the same characteristics as the species caught in the Manila Bay by Bataan fishermen and made into *tuyo*. Evidently the difference lies in the method of preparation.

For the benefit of those who may be interested in the adoption of the method used in Orion, Bataan, a translation of a simple recipe for making *tuyong tonsoy* is here given. This recipe written in Tagalog was secured by Gregorio S. Chan, a student in the College of Agriculture.

For one petroleum can of this kind of fish prepare a brine of three gantas (9 liters) of common salt. Or the proportion may be a *canastro* (a common dry measure basket) of fish and a brine made of one and a half cavan (25 gantas) of salt. In making the brine care should be taken to dissolve the salt thoroughly in water. Then the fish are immersed in the brine. To keep the fish from spoiling more salt is added on the top of the pile of fish in brine. If the fish are put in the brine in the evening, they should be washed in the morning with fresh water and spread out at once on a bamboo slat flat tray and put to dry in the sun. At noon time the dried fish are counted and turned over for further drying by placing an empty tray on top of the fish and inverting the first tray which is then removed. The drying process is continued in the afternoon as long as there is sunshine. In bright sunshine, it takes only one day to finish the drying; but sometimes it takes one day and a half, depending upon the degree of dryness of the salted fish. Once the fish are dry they are allowed to cool off on the tray, then are packed up in baskets (*canastro*), ready for the market.

There are two kinds of this Bataan *tuyo*, *tuyong tonsoy* and *tuyong lapad*. They are treated alike in the process of preservation; but the fish

used in making *tonsoy* is larger, more meaty, fatter and more tasty than that used in making lapad, and sells at a higher price. But the keeping quality of the *lapad* is better because it has less fat than the *tonsoy*.

More College Copra Drier Enthusiasts

In previous issues of this Journal mention has been made in these notes of the continued requests for information about the College Copra Drier. Mention has been made also of several driers of the College type having been built in nearby provinces. Recently requests from three plantation owners for a College representative to direct the construction of driers of the College type were received. The first was from Mrs. Caselda de Mejia of Ormoc, Leyte, the second from M. L. Liddell of the Sumagui Lumber Company of Pinamalayan, Mindoro, and the third from Mr. Espiridion Villegas of Vallehermoso, Oriental Negros. These requests are accompanied by offer to pay all the travelling expenses of the College representative from the College to the places and return.

The first request was favorably considered. The College extension representative is waiting for communication from Mrs. Mejia as to whether all the materials are ready in accordance with the list furnished her. The other requests can be complied with only after the work in Leyte is finished as there is no available man in the Extension Division to send.

It should be mentioned in connection with the first request that the man responsible for the arrangements with Mrs. Mejia is Mr. Mauro Rodriguez, Extension Agent of the Bureau of Agriculture stationed at Leyte. If the College drier should become popular in Leyte as a result of its introduction in Mrs. Mejia's hacienda credit will be due Mr. Rodriguez.

Relative Importance of Extension Service in a College of Agriculture

There is no State College of Agriculture in the whole United States that does not maintain with adequate support a strong Extension Department with its own Director and a personnel and activities much larger in scope than any other department of the institution. Its rôle and function are considered essential to the College of Agriculture in its function of serving the interests of the farmers. It is through its agency that the College learns the real needs of the farmers and humanizes and puts into practical and productive use the results of its investigation and research underlying its program of instruction, by direct and helpful contact with the farming public. The relative importance of Extension service is depicted in the following list of activities for which the land Grant Colleges Dollar was spent in 1925–26:

Resident Instruction	35 cents
Physical Extension	13 "
Extension Service	12 "
Research	8 "

Operation and maintenance of plant	8	"
Supplementary operation	6	"
Administration	6	"
Dining Halls	3	"
Trust Funds	3	"
Hospital	2	"
General Library	2	"
Dormitories	1	"

These figures are from a Survey of Land Grant Colleges by Walter J. Greenleaf, Assistant Specialist in land grant college statistics, 1927.

The father of Extension Service of America, Professor Knapp, once stated in the early days of the American Extension Service that sooner or later every modern civilized country was bound to establish and maintain an extension service for the country.

Referring to the county-agent service in America back in 1916 (1916 Year Book of the United States Department of Agriculture) Mr. Carl Vrooman, Assistant Secretary of Agriculture, said:

> This county-agent movement is the greatest and most practical university extension movement ever inaugurated in any country. It is essentially nothing but learning democraticized, learning brought out of the laboratory and the experimental field, out of the libraries and the bulletins, adapted to local conditions, and brought home to the farmer by the power of personal explanation and of actual demonstration.

In our opinion there is no country on earth no matter how backward in civilization that is not ready and amenable to receive and benefit by the Extension Service as long as the methods used are adapted to local conditions. Personally it was observed that even in modern civilized countries, the first attempt at Extension Service was not received with much favor and enthusiasm by the farming public. But the attempt continued with more and more vigor, until the time came that the same public came of its own accord to recognize the indispensability of Extension Service for the rapid amelioration of rural communities and farming conditions.

EXCHANGE NOTES

Probably the most interesting of the dairy landmarks kept at the Wisconsin institution is the first Babcock test, a device invented by S. M. Babcock, who is still living in Madison, and even at the age of 84 is often found busying himself in his laboratory. The original testing machine is, as would be expected, a large, cumbersome contrivance alongside of the present, attractive models. No change, however, has been made in the principle by which it operates since Dr. Babcock perfected in in the late eighties.

On the campus of the Wisconsin institution stands the first school in which special dairy courses were given in the country. This was established in 1890, as an outgrowth of the perfection of the Babcock test.

—*Butter and Cheese Journal.*

On many farms plans are now being made to sow substitute or emergency hay crops. "The soybean is the best hay substitute for dairymen when there are shortages of clover and alfalfa," declares a farmer. "It contains as much, if not more, protein than alfalfa and if harvested with care its palatability is unquestioned."

—*The Prairie Farmer* (Illinois).

What might be called an insect zoo has just opened in Paris where the public is turning its attention from the lions and tigers in the menageries to see the new vivarium in the Jardin des Plantes. Here it has the extraordinary experience of watching insects in their natural environments, each group shown in an indoor glass cage fitted up to seem like home to the inhabitants.

This somewhat unique accomplishment has not been so easy as it might seem. The insects come from various climates and their requirements are naturally vastly different. Thus a complicated heating system is necessary to simulate the African desert in one cage and a coolish temperature in the next. Heat, humidity and light have all formed tremendous problems solved by the ingenuity of Dr. Jeannel, director of the vivarium.

In some cases it has been necessary to fool the insects for the benefit of the public. In their desire to establish the closest possible contact with objects about them, the scorpions, if left to their own devices would completely disappear from sight by burying themselves and leave the public to look at a seemingly empty cage. However, they seem very well satisfied to hide beneath plates of transparent glass through which they can easily be seen.

—*Science.*

The Name *Gur*, we are told in the Supplement to the *Indian Trade Journal* of March 1, on "Gur and its Prices in India," by Kasanji D. Naik, M. A., of the Sugar Bureau at Pusa comes from *guda* or *gula*, indicating a thickened ball or mass, and hence thickened sap or the modern *gu*, or raw sugar. *Jaggery* is a corruption of *sarkara*, via the Malaya word *chakkara* and the Portuguese *Jagara* or *Jagra*. *Gur* when clean is a perfectly wholesome food; it is, in fact, preferred even to sugar at times. Its delicious aroma and greater sweetness appeal to many palates. It has also been stated that it is rich in vitamin B, which white sugar lacks. Fine golden-yellow coloured *gur* generally fetches the highest price. When the cane

juice is left semi-liquid, that is half-way to *gur*, it is known as *rab*, and in that state is purchased by others to be refined.

—*Tropical Life.*

Margaret R. Pool, a sophomore in home economics, won the silver trophy awarded to the fastest co-ed milker by the little International Livestock Show held recently at Ohio State University.—*Agricultural Student.*

—*The Iowa Agriculturist* (Iowa State College).

The importation into the Union of South Africa is prohibited of bone meal or other bone fertilizers or farm foods (except dissolved bone) or any fertilizer or farm food containing meat meal, blood meal, or any product derived from any animal carcass, unless accompanied by a sworn declaration from the manufacturer that it has been effectively sterilized and that the sterilizing plant has been inspected by a competent government official.

—*Commerce Reports* (U.S.A.).

Weight for weight, dried prunes supply more body fuel than dried apples, milk, roast beef, eggs or bread. This is chiefly on account of the high carbohydrate content, and I do not mean to say that prunes are a better diet than, say milk, for many other factors such as protein balance or ratio, digestibility, &c., must be taken into account. However, prunes are a highly nutritious food, and in addition they are laxative. Why not buy prunes instead of pills; the old saying, "An apple a day keeps the doctor away," might have added to it "Six prunes a night will starve him outright".

—W. M. Josephson *at Murrumburran Bureau of Conference.*

—*Agricultural Gazette* (N. S. W.)

COLLEGE AND ALUMNI NOTES

Major A. Parker Hitchens, medical adviser to the Governor General and lecturer in the School of Sanitation and Public Health, addressed the Student Body at Convocation in July. Major Hitchens spoke on the diseases prevailing in the Philippines that are most detrimental to economic progress. As listed by the speaker, these are: tuberculosis, beri-beri, intestinal diseases, leprosy, and malaria. How these diseases retard progress and how they can be controlled and eradicated were simply and forcefully presented by Major Hitchens.

Dr. Walter Williams, Dean of the School of Journalism in University of Missouri, accompanied by Mrs. Williams and Mr. Roy C. Bennett, Editor of *Manila Daily Bulletin*, were Campus visitors in July, guests of

Professor Yule. The School of Journalism of which Doctor Williams is dean and founder is the oldest in the world.

Miss Alice E. Thuman reported for duty as instructor in English on July 26. Miss Thuman is a graduate from University of Nebraska. She came to the Philippines via Europe.

Mr. E. J. de Boer, of Seattle, Washington, brought in a shipment of 26 head of Holstein cattle on July 13. This is the first important importation of this breed of dairy cows in the Philippines. The Department of Animal Husbandry acquired two cows paying one thousand pesos a head. The average yield of milk per cow a day has been 16 to 17 liters.

The following letter to Professor Yule from Mr. Dimas Maulit who completed his work for graduation in May, is a tribute to the late Dean Baker, so spontaneous, so sincere that we share it with our readers:

I am sending you herewith as my humble contribution to the Baker Memorial Fund a postal money order for five pesos (₱5.00). Please accept it as a token of my reverence for the memory of our beloved dean. I cannot forget him. He loved his students and was most generous to them. He sincerely believed in them and such a great faith in them as he always showed encouraged and inspired them with manly self-confidence in their struggle for the realization of their ambitions. No wonder he has been called the inspirer of youth and maker of men.

Mr. Maulit is teaching in Central Agricultural School at Muñoz.

Mr. Francisco Sacay, B.S. '27, now a U. P. Fellow studying in Cornell University in a letter to Professor Yule, inclosing a contribution to the Baker Memorial Fund, writes briefly of his trip across the Pacific and the United States, but more fully on his need of all the training and teaching he had received in English. Mr. Sacay registered for every English course given in this College making a record of 1 in English 6 and 11.

The papers read and discussed at the meeting of the Los Baños Biological Club on June 20 were:

"Agricultural problems in the island of Hermano Mayor"
by Dr. R. B. Espino

"Observations in Bukidnon" by Dean Gregorio San Agustin.

At the meeting held on July 16 the papers presented were:

"Some observations on agricultural research in Japan"
by Dr. R. L. Pendleton.

"The Imperial Government Institute for Nutrition, Japan,"
by Dr. F. O. Santos.

The Mimics with Miss Cole as Director began work in August. The Department of English under which the club functions made some changes in the organization this year. Members are limited to students in the College of Agriculture of collegiate classification. There are weekly meetings of one hour devoted to study of the technique of the drama and its presentation. Attendance and work of members are recorded as in regular college work. "Daughters for Sale" will be the first play presented.

The twenty-eight women students in College this year are organized as "The Associated Women Students of the College of Agriculture." Miss Anderson of the Department of English under whose supervision the organization was completed is the official Adviser.

The most important features of the first monthly meeting of the Self-Made Man Association," a student organization of the College of Agriculture on August 2, 1928, were: (1) the general revival of the spirit of co-operation among the members present; (2) the creation of a new committee to look after the safety of the interests of the Association; (3) the formulation of feasible plans to campaign for more members and to raise some more money so as to "swell" its fund and thereby live up to its principles of helping the many poor needy student members; (4) the report of the Treasurer through the out-going president, F. N. Camba; and (5) the election which was followed by the installation of the elected officers who are as follows:

President.....Paulino M. Ungos
Vice-Pres.....Felix A. Padlan
Secretary.....Procopio G. Giralao
Treasurer.....Felix N. Camba
Adviser.....Prof. M. B. Raymundo

On Aug. 3, 1928, a snappy musical-literary program was held in the Auditorium of the College of Agriculture under the auspices of the Military Department. Some of the special features of the program were the "Leaf" selection by Cadet Pvt. Lorenzo Talatala; the "Classical African Trot" by Cadet Pvt. Honorio Reyes; the address by Major Gilmore; and the award of medals and badges to cadets and sponsors by Mrs. R. A. Gilmore. The program closed with the "Third Batallion March" by the audience.

The promotor of the program was the Anta-Luns, an organized body of cadet officers of the College of Agriculture who deserve commendation for putting on a very lively program which for the time broke the monotony of the students' daily grind on the campus.

During the town fiesta at Magdalena, Laguna, on July 22, 1928, the U. P. Los Baños basketball team in a game with the Laguna High School

team, won with a score of 32–8; the Magdalenaians, with a score of 28–10. The College winning team was awarded a silver cup donated by the Magdalena Elementary School teachers.

The Fourth Annual Intramural Athletic League of the Los Baños Colleges was formally opened on July 31, 1928, by Dr. Gregorio San Agustin, this year's chairman of the Los Baños Committee of Athletic Management. Chairman San Agustin tossed the first ball. There are seven units competing for the championship events in the League: namely: (1) C. A. Seniors ('29); (2) C. A. Juniors ('30); (3) C. A. Sophomores ('31); (4) C. A. Freshmen ('32); (5) C. A. Supplementary-Preparatory-Special; (6) Veterinary; and, (7) Forestry. Strong competition is again expected this year with Alkan, Inc., once more offering valuable prizes to the winners of each of the following events: (1) Basket ball; (2) Volley ball; (3) Soccer Football; (4) Relay Carnival; and, (5) Track and Field.

Dr. S. A. Francisco, College Physician, is now giving one-hour weekly lectures on Personal Hygiene to the freshmen of the College of Agriculture. This is a Physical Education requirement of all first year Collegiate students in the University.

Both the Los Baños Faculty Sporting Club and the Los Baños Colleges Sporting Club held tennis singles handicap tournaments during May and June, 1928. In the former, Ramon P. Tolentino, Jr., of the Department of Physical Education came out triumphant and won the silver loving cup donated by Brias Roxas, Inc. In the latter, Roberto R. Moreno and Francisco Barros, both of the Chemistry Department, were awarded the tennis rackets offered by the Athletic Supply Co. to the winners in the Class A and Class B Groups, respectively.

On June 9, 1928, the first dual tennis meet between the Manila and Los Baños faculty members was held on the Los Baños Faculty Sporting Club courts. The Manilans won six of the nine matches played and thereby captured the Brias Roxas cup. Those who represented the U. P. Manila faculty were Lieutenant Guevara, Doctors Alvir, Vasquez, Mandanas, Velarde, Tan, Quiason and Gokhale; Professors Manguerra, Virata and Zafra, and Mr. Jison. The Los Baños line-up was composed of Doctors San Agustin, Francisco, Mendiola, Lava, Espino, Tubangui, Gordon, Mondoñedo, and Adriano; Professor Sulit, Lieutenant Martelino, and Messrs. Tolentino and Mabakiao.

A return encounter between these two teams in Manila is scheduled for August 11 on the Philippine Columbian Association tennis courts. A close competition is anticipated.